THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1765.] LONDON, MARCH 9, 1897. [49TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

GAS CONSUMERS' REQUIREMENTS.
TUBES, COCKS, UNIONS, BRACKETS, PENDANTS, LANTERNS, CHANDELIERS, AND GENERAL FITTINGS.
MANUFACTURED BY
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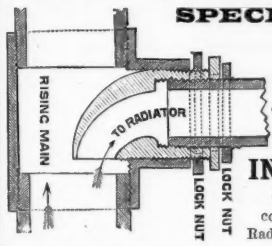
15, 16, 17, Kirby Street, London, E.C.



SPECIALITE
FOR
HOT-WATER CIRCULATION,
'ACME' PATENT INJECTOR,
to be fixed in connection with Radiators on Mains.

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PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
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'BEAR CREEK' CANNEL
LOG MOUNTAIN COAL, COKE, AND TIMBER CO.
PINEVILLE, KENTUCKY, U.S.A.
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"HULL, PINEVILLE." Codes used "ABC" & "A1."
Communications to the Company only.

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

4,444
"MELDRUM" FURNACES
MADE TO DECEMBER 16th, 1896.
No Gas-Works should be without. WRITE FOR CATALOGUE & TESTIMONIALS.
MELDRUM BROS., ATLANTIC WORKS, **MANCHESTER,**
Also at London, Leeds, Birmingham, Liverpool, Newcastle, and Glasgow.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, LIMITED,

ENGINEERS & CONTRACTORS FOR GAS-WORKS.

TELEGRAPHIC ADDRESS: "COCKEYS FROME."

THE IRON-WORKS, FROME.

Messrs. COCKEY desire to draw the attention of Gas Engineers and Managers to their new form of GAS WASHER, which, by a recent patent, converts their HORIZONTAL Washer into one of a VERTICAL form.

The principle is the same as in the horizontal one, which has now been before the profession for a number of years, and where adopted is giving unqualified satisfaction.

The Washer is entirely automatic in its action, and does not therefore need any motive power—an advantage which will be apparent to all.

It is made in all sizes, from 25,000 TO 3,000,000 FEET PER DAY; and Messrs. COCKEY invite inquiries, which shall have early attention.

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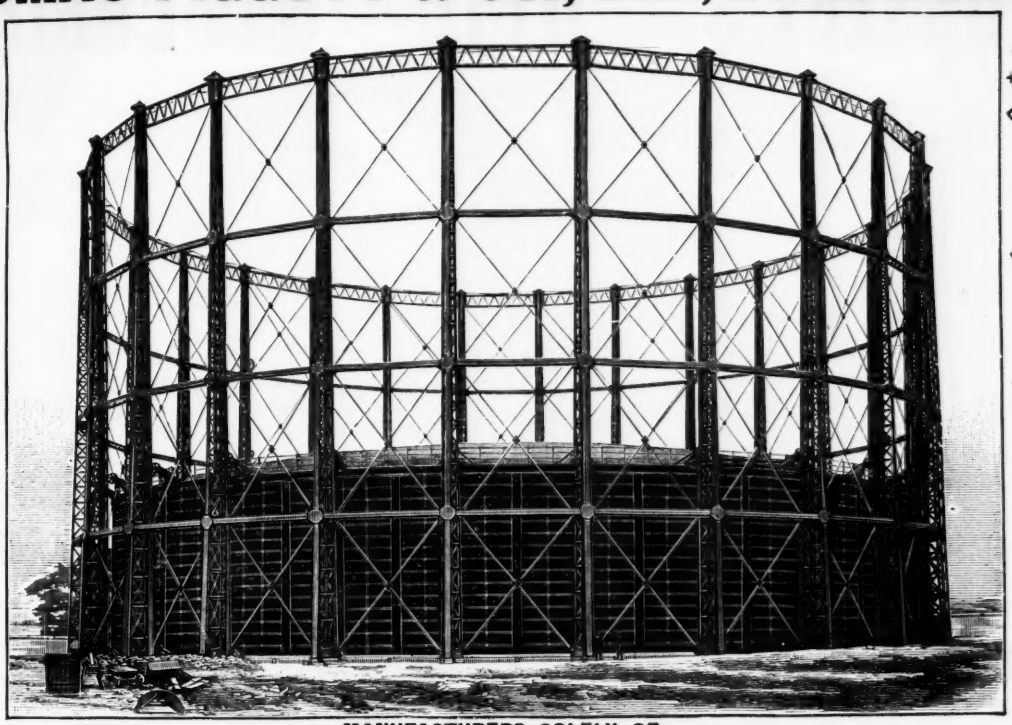

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PATENT CARBURETTED WATER-GAS PLANT.

INSTALLATIONS have already been supplied, and are in operation at the following Gas-Works: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (Second Contract), HOYLAKE; and are in course of erection at: BELFAST (Second Contract), EDINBURGH, TOTTENHAM, WINCHESTER, MANCHESTER, BRUSSELS (Second Contract), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY.

All Particulars from Patentees: 9, VICTORIA STREET, LONDON, S.W.

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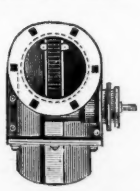

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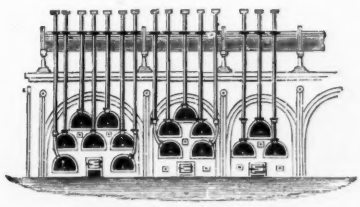
Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.



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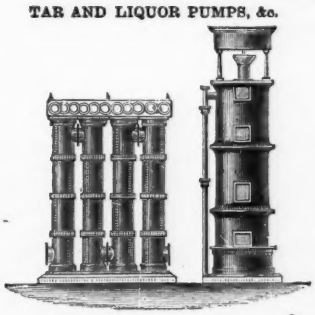

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for working Purifiers,

Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

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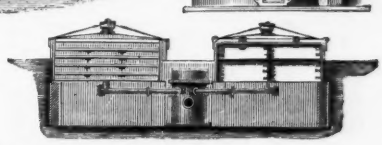


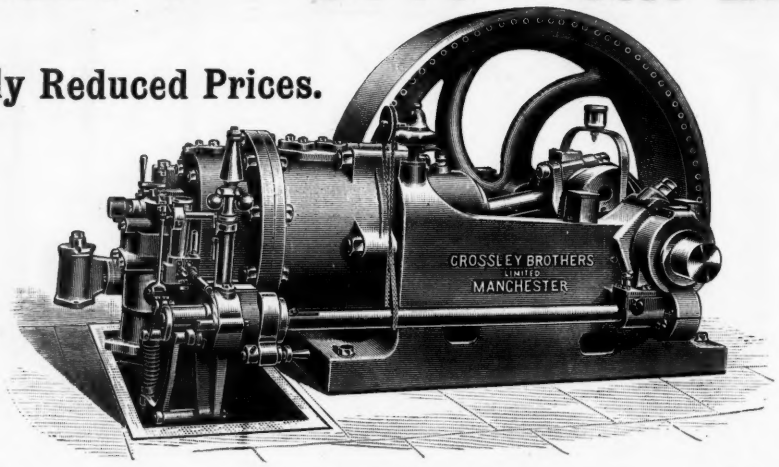
DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,
STOURBRIDGE, ENGLAND
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

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GAS ENGINEERS AND IRONFOUNDERS,
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COAL-BREAKERS. COKE-SCREENS.
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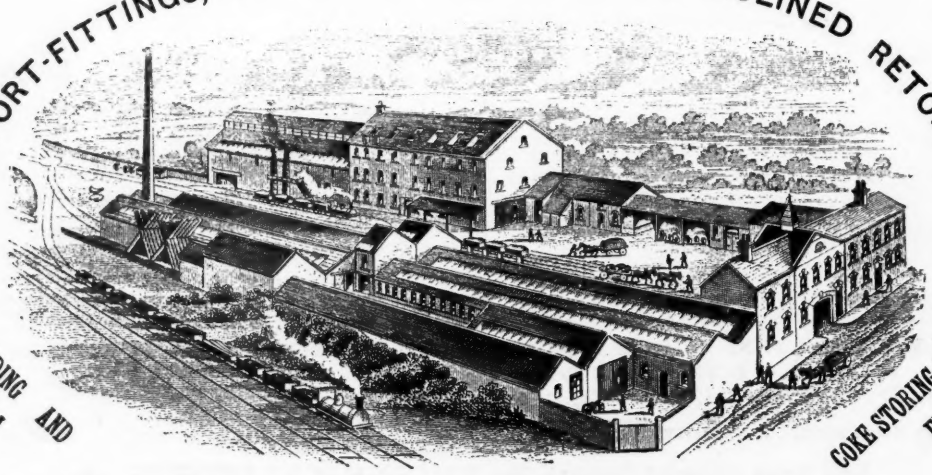


COAL UNLOADING AND CONVEYING A SPECIALITY.

COKE STORING PLANT, ENGINES, EXHAUSTERS, VALVES.

BEEHIVE WORKS, **RETFORD,** NOTTS.

WELLS' LIGHTNING PAINTER

PAINTING BY MACHINERY. GREAT SAVING IN TIME AND LABOUR.

INVALUABLE FOR PAINTING GASHOLDERS, GIRDER WORK, &c.

No. 1 Painting Machine, attached to a Single Air-Compressor, driven by Belt Power. Can be arranged with Handle for Man Power.

No. 1 Painter	£20 0 0
No. 2 „	25 0 0
Single Air-Compressor	16 10 0
Double „ „	25 0 0

No. 2 Painter may be arranged with Two Sets of Nozzles, Hose, &c., for Two Men to Work from one Machine, £8 extra.

Speed 3 Square Yards per Minute.

FOR
GAS ENGINEERS,
CONTRACTORS,
GIRDER YARDS,
BRIDGE BUILDERS,
BOILER SHOPS,
&c., &c.

AS SUPPLIED TO THE
GLASGOW,
NOTTINGHAM,
and OLDHAM
CORPORATION
GAS-WORKS.

Send for Illustrated Price Lists.

Special Steam Portable Painting Plant Complete, for working round Large Surfaces such as Gasholders, &c.

Price: Engine and Air-Compressor, with Boiler on Wheel Base, £90.
No. 2 Painter . . . . . £25.

A. C. WELLS & CO., MIDLAND ROAD, ST. PANCRAS, LONDON. BRANCH: CARNARVON ST., MANCHESTER.

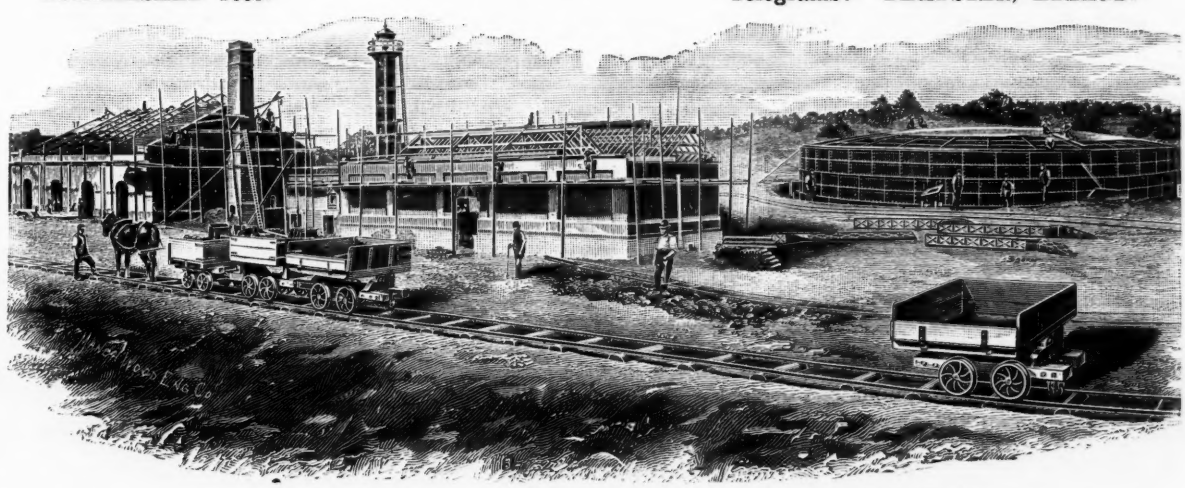
R. DEMPSTER & SONS,

LIMITED,

GAS ENGINEERS and CONTRACTORS,

ELLAND, YORKS.

ESTABLISHED 1885. Telegrams: "DEMPSTER, ELLAND."



Engraved from Photograph of Complete Gas-Works in course of Construction.

The WHOLE of the Apparatus, Foundations, Retort Work, Buildings, and Levelling of Site have been executed by our own Workmen. No Sub-Contracts.

Estimates and Illustrations for complete Works, or for any detailed parts, supplied gratis on application.
Tenders given for all kinds of Structural Ironwork.

INCANDESCENT GAS-LIGHT

(WELSBACH PATENTS).

THE GREATLY REDUCED CONSUMPTION OF GAS

Covers the Initial Cost of the Burner in less than SIX Months.

The Prices have been REDUCED as follows :—

The Ordinary "C" Burner, price 6/6

The "C" Bye-Pass Burner, „ 7/6

Prices of other Patterns Reduced Proportionately.

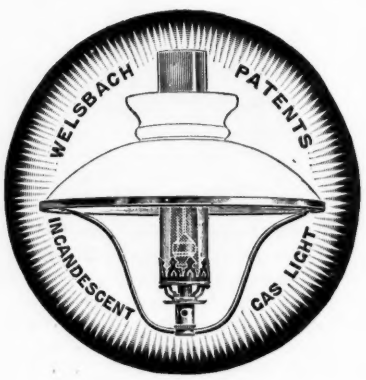
Special attention is called to

The New "Gem" Burner, price 5/6

which, with a consumption of $1\frac{3}{4}$ cubic feet of gas an hour, gives

A LIGHT OF 30 TO 35 CANDLE POWER.

This pattern is particularly suited for Domestic Lighting, and is specially recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to **Popularize the Use of Gas** as an Illuminant, owing to the following Advantages :—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.

Freedom from Smoke, Dirt, and Flickering.

Greatly Reduced Heat.

The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the **Healthiest, Best, and most Economical System of Gas Lighting.**

Suitable for every purpose of **Inside and Outside Lighting.**

Avoid the WORTHLESS IMITATIONS now being offered by UNSCRUPULOUS INFRINGERS.

OVER ONE HUNDRED AND FIFTY JUDGMENTS

and Interim Injunctions recently obtained against Companies, Firms, and Persons INFRINGING THE "WELSBACH" PATENTS, or INFRINGING THE LIMITED LICENSE under which the Mantles are sold.

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PALMER STREET, WESTMINSTER, LONDON, S.W.

EXCHANGE TELEPHONE: NO. 1756 BANK.

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TELEGRAPHIC ADDRESS "ROBUSTNESS, LONDON."

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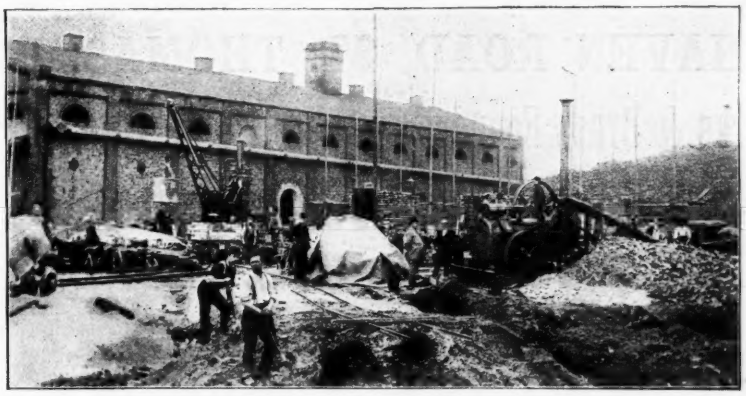
Complete Erection or otherwise.

Gasholders, Tanks, and Reservoirs of all sizes.

Gas and Water Main Laying a Speciality.



Retort Setting a "Speciality." Inclined or Horizontal Settings (with or without Regenerative or Generative Furnaces) of the most approved and Economical Designs.

ESTIMATES SUBMITTED FOR

Gas and Water Work of Every Description.

Contractors to H.M. Government.

For Retort Advertisement, see last week's "JOURNAL."

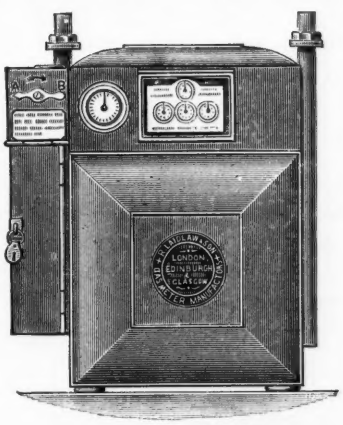
R. LAIDLAW & SON

GAS & WATER ENGINEERS.

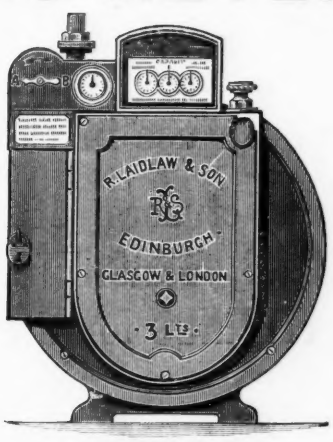
MANUFACTURERS OF WET & DRY GAS-METERS,

SIEMENS WATER-METERS,

PREPAYMENT GAS-METERS.



—DRY METER.—



—WET METER.—

EDINBURGH: SIMON SQUARE WORKS. | **GLASGOW:** ALLIANCE FOUNDRY. | **LONDON:** 6, LITTLE BUSH LANE.

WILLEY & CO., GAS ENGINEERS,

CONTRACTORS TO THE GOVERNMENT,

LONDON & EXETER.

Offices: HAVEN ROAD, ST. THOMAS, EXETER.

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LATEST SPECIALITIES.

WATER-GAS APPARATUS—A Model Plant in course of erection at their Exeter Engineering Works. Continuous Process; the best Results yet attainable.

COLUMNLESS GASHOLDERS—Makers of Gadd & Mason's Patent System.

Agents for the **MAXIM CARBURETTOR.**

GAS ENRICHMENT in bulk or on Outlet Main.

Makers of the **LIVESEY WASHER.**

Manufacturers of **WET AND DRY GAS-METERS.**

Their Patent **PENNY-IN-THE-SLOT AUTOMATIC METER,** admittedly one of the most perfect in the Market. Thousands in use in London and the Provinces.

Manufacturers of **GAS-FITTINGS** in endless variety—**CHANDELIERS, BRACKETS, PENDANTS, MAIN COCKS, &c., &c., &c.** **SPECIAL FITTINGS** for the Automatic Business.

Metropolitan Agent;

FRANK ACLAND, M.Inst.C.E., M.Inst.M.E., 76, Cheapside, E.C.

Telegraphic Address: "WILLEY, EXETER." Telephone 132. Established over 30 Years.

This is NOT an UNSOLICITED Testimonial!

Having noticed, from time to time, that Mr. FULLER was sending us orders for our No. 11 Economic Enamelled "Metropolitan" Gas Kitchener (Price £11 15s. 6d.), it occurred to us to write to him, and we did—

196-200, CAMBERWELL ROAD, S.E.,

January 28th, 1897.

Dear Sir,

We are given to understand that you have a large number of our No. 11 "Metropolitans" in use. Under these circumstances, we feel that you are in a very favourable position to speak as to the merits or demerits of our Cooking-Stoves; and, therefore, an opinion from you should have exceptional weight.

Faithfully yours,

(Signed) The DAVIS GAS-STOVE COMPANY, Ltd.

We had not the pleasure of knowing Mr. FULLER; and, although we had *primâ facie* grounds for supposing his answer would be favourable, seeing that he had repeated his orders, we were a little curious and anxious to receive his decision.

Subjoined is a verbatim copy of his courteous reply:

FULLER'S (Limited) American Confectioners,
358, STRAND, LONDON, W.C.,

February 4th, 1897.

Dear Sirs,

We are now using EIGHTEEN of your No. 11 Cookers, and have been using most of them SEVERAL YEARS; we are pleased to say that they work SATISFACTORILY.

We use most of them in baking DELICATE PASTRY, and believe that, for our purpose, they are MUCH SUPERIOR to the large bakers' ovens ordinarily used for such work.

Very truly,

(Signed) W. B. FULLER, Manager.

To Messrs. The DAVIS GAS-STOVE COMPANY, Limited,
"Metropolitan" Engineering Works,
CAMBERWELL, S.E.

This, then, is the **latest Testimonial** to the **ever-increasing popularity** of our "Metropolitan" Gas Kitcheners. It is a **"solicited"** one; and we send it forth **sailing under its own colours.**

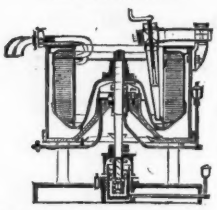
KIRKHAM, HULETT, & CHANDLER, Ld.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

MARSHALL'S PATENT COMBINED BATTERY CONDENSER AND SCRUBBER.

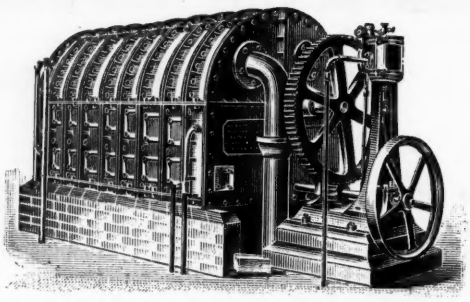
Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

BURMEISTER AND WAIN'S TAR-SEPARATOR.



EXTRACTS OVER 99 PER CENT. OF AMMONIACAL LIQUOR FROM TAR.

PATENT "STANDARD" WASHER-SCRUBBER.

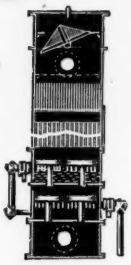


OVER **530** *MACHINES*

In use and in course of Construction.

They extract all the Ammonia and a large proportion of Carbonic Acid and Sulphuretted Hydrogen.

PATENT "STANDARD" VERTICAL SCRUBBER AND TAR-EXTRACTOR.



SUITABLE FOR SMALL WORKS WITHOUT AVAILABLE MOTIVE POWER FOR MECHANICAL WASHERS.

MARSHALL'S PATENT TAR EXTRACTOR AND WASHER.

Extract from letter from the Late Mr. Jabez Church: "The Marshall Patent Tar-Extractor has given very satisfactcry results."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

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THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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GIBBONS BROTHERS, LIMITED,

Telegraphic Address: "GIBBONS, DUDLEY."

DUDLEY,

Telephone No. 8013.

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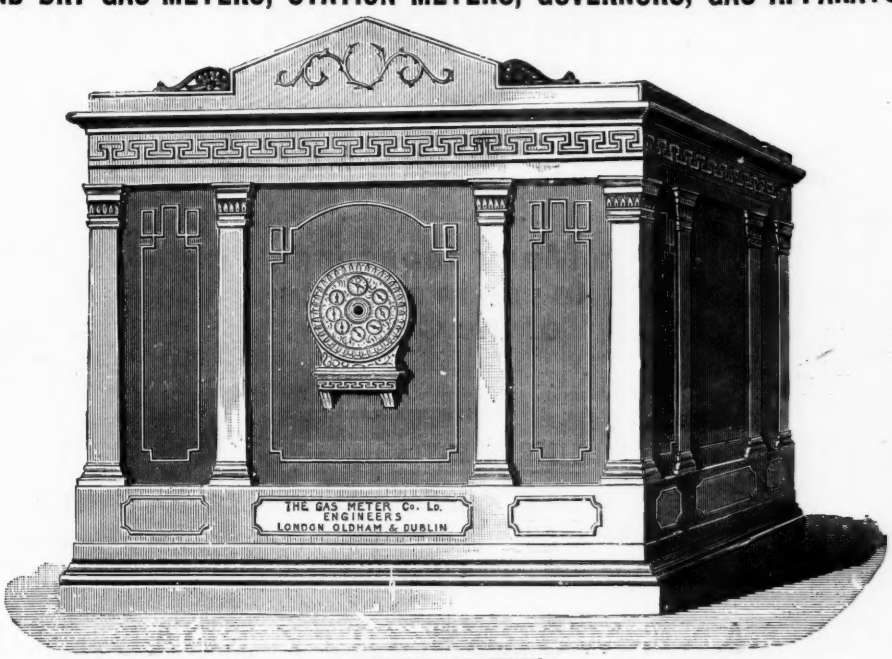

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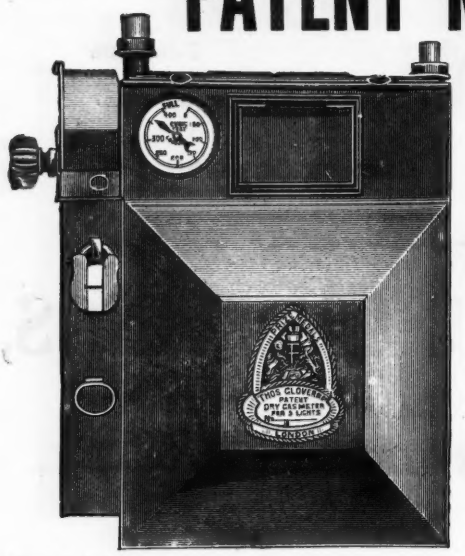

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[See also Advt. p. 568.

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EDITORIAL NOTES.

Carburetted Water Gas for Liverpool and Elsewhere—A "Case" Wanted.

A REPORT by Mr. C. R. Bellamy, the Gas Inspector and Superintendent of Street Lighting to the City of Liverpool, on the nature and suitability of carburetted water gas for public supplies, has just been presented to the Lighting Committee of the Corporation. The report has been awaited with considerable local interest, in consequence of the proceedings in this regard of the Liverpool Gas Company and the Birkenhead Corporation Gas Committee. A curious situation has been created upon the Mersey by the declared desire and resolve of the Local Authority upon the one side of the river to adopt, in the public interest, a kind of gas-making plant the use of which (by the Gas Company) the Local Authority on the other side are being instigated by a noisy section of the public to condemn—also in the public interest. There cannot be so much difference between Liverpool and Birkenhead that what is good for one is bad for the other; and the endorsement of the policy of the Liverpool Gas Company by the Birkenhead Gas Committee is something which the critics of the former find painfully discouraging. Moreover, the Liverpool Corporation only the other day sent to Birmingham for an expert in gas supply as understood by a Municipality, in order that he might pick holes, if possible, in the Gas Company's policy; and behold! Birmingham is now going in for carburetted water gas even as Liverpool has done—perhaps more so. Evidently, there was nothing for it but for the Liverpool Corporation to try in a fresh quarter for information on the important question of carburetted water gas; and to Mr. Bellamy was allotted the task of bringing before them the materials on which they might base an independent judgment respecting the existence or otherwise of justification for the action of the Gas Company. Mr. Bellamy has now discharged himself of this duty. His report concludes with the statement that, "taking all the "circumstances into consideration, there does not at "present appear sufficient reason for objecting to the introduction of carburetted water gas, assuming that it is "supplied in admixture with coal gas in the proportion of "about 25 per cent.; that it can be supplied at a cheaper "rate than coal gas; and that due care is taken in using "it. But it is very important that the admixture should be "definite and general throughout the city."

These conclusions are not likely to perfectly please anybody. This does not mean that they strike the average between rival claims, and, therefore, like the result of an arbitration that "splits the difference," may be supposed to do substantial justice, but only that they are inconclusive on some points and weak on others. Assuming for the moment that the presumption as to the harmlessness of a 25 per cent. admixture of carburetted water gas with coal gas is correct, it is superfluous to say that such admixture should be "definite and general throughout the city." The point refers to what every consumer should receive, if there is any point in the recommendation. What is the precise meaning of the condition that "due care" should be taken in using the prescribed mixture? Surely, due care must be exercised by the user of any illuminating gas. If more care is demanded of the user of one kind of gas than is necessary in the case of another kind, how is this to be measured? How is the responsibility to be rightly apportioned as between user and provider? Again, what has the question of cheapness to do with Mr. Bellamy, or he with it, that he should mention it? This is a consideration purely for the undertakers of the new supply. Lastly, why restrict the admixture of carburetted water gas with coal gas to 25 per cent.? We notice that a Liverpool chemist—Mr. A. Smetham—has lost no time in traversing Mr. Bellamy's conclusions; and we agree with him to the extent of thinking that they are not supported by the substance of the report. The main contention—the one respecting the absence of reason for objecting to the admixture of carburetted water gas with coal gas in the named proportion—may or may not be just; but it certainly does not arise out of the alleged premises.

The question at issue is very plain and simple, being no more than whether carburetted water gas, mixed or "neat," is more dangerous, or otherwise prejudicial to the

gas consumers' interests of any kind, than coal gas. If it is, then we are of opinion that an action would lie against the suppliers of it. But is it? Without wishing to be rude, we still venture to declare that in this connection the oft-quoted statements repeated by Mr. Bellamy about the American opposition to carburetted water gas and its abandonment are absolutely valueless as evidence. The sole piece of firm ground that has been discovered so far in these investigations is to be found in the observation of Dr. Campbell Brown, the analyst quoted in Mr. Bellamy's report, that, "in order to form an opinion on the suitability "of carburetted water gas for the general purposes of "domestic use, certain data would be necessary which "have never yet been published." The negative character of this declaration does not detract from its value; for it is perfectly, startlingly true that definite, reliable information on the point at issue does not exist, or if it exists has never been published. In the meanwhile, gas undertakings have gone on, as their administrators were fully entitled to do, trying it, on the principle *solvitur ambulando*. Industrial enterprise never has been baulked by hypothetical computations of the risk to be expected from new ways of doing things. Clever people once ridiculed the notion of supplying illuminating gas to a town from a common centre; but it was done. It was regarded as impossible to cross the Atlantic by steam navigation, until the voyage was made. Illustrations of the same kind might be multiplied to any extent; but it would be superfluous to do so. We are not particularly interested in carburetted water-gas development, except in its aspect as a means of cheapening gas supply to the people. Wherever it can be shown to be a good expedient to adopt, having regard to local conditions, there let it be adopted. Of course, if it is a bad thing, a dangerous thing, then no gas undertaking anywhere has any right to meddle with it. The public interest is, and must remain, the touchstone; and there have been more than enough of vague statements on both sides and all round this ultimate test. Let us have no more of them, but simply definite presentments of the matter whereon a man might hope to obtain, or defeat, an injunction restraining the manufacture and sale of carburetted water gas.

The Carbide of Calcium Regulations.

In another column will be found the full text of the important Memorandum issued by the Home Office for the assistance of Local Authorities in carrying out the Order in Council by which the keeping of carbide of calcium has been brought under the provisions of the Petroleum Act, 1871. For the instruction of the public as to the nature and properties of this new commodity, Colonel Sir V. D. Majendie has condensed into a few brief, crisp sentences all the information in this regard needed by anybody who may be called upon to deal with the product in any way. The official Memorandum is naturally divided into two sets of recommendations—one set applying to the keeping and conveying of the carbide of calcium; and the other referring to its use in the preparation of acetylene. The regulations to be observed under the former division are plain, and not difficult to carry into practice. Carbide of calcium is only to be kept or carried in hermetically closed packages; and the store must be adequately ventilated. This is simple enough; but complication begins with the directions that only pure carbide of calcium is to be kept at all, and that "efficient arrangements" are to be made for the sampling and the testing of the substance. Who is to fix the standard of purity; and how is the bulk to be sampled? It is to be noted that nothing is said as to the quantity, or the number of packages that may be put in one store; and apparently not a pound tin may be kept without a licence. This is a traffic to which Port Authorities should direct very special attention, with the object of preventing any cheap and impure foreign carbide from entering the country. If such stuff once gets in, the temptation to small dealers to sell an inferior grade of the article will be very urgent.

With regard to the employment of carbide of calcium for the generation of acetylene, the Memorandum discourages the use of high-pressure apparatus. But here again a margin seems to be left for the exercise of the discretion of Local Authorities by the direction to prohibit any "powerful compression" of the gas. The exclusion of copper from the possibility of contact with either the carbide or its gaseous product is a comparatively simple matter; but the requirements respecting the safe disposal of the residue from acetylene apparatus—that it should not be discharged into sewers unless mixed with at least ten times its bulk of water—is easier to formulate than to ensure. The most onerous recommendation of all, however, and the one at which Local Authorities will look most askance, is the last but one in the list. It directs those authorities who are under the Petroleum Act to make provision for "the use only of an apparatus (for the "production of acetylene from carbide) which the Local "Authority have satisfied themselves, under competent "advice, is of a safe and suitable character, and the "prohibition of the employment for the manipulation of "such apparatus of any person other than a properly "instructed and capable operator." The world is as yet too strange to acetylene lighting for anybody to be able to say offhand upon what scale and for what purposes this method of lighting will be found desirable. On the face of it, acetylene lighting might serve the purpose of a factory owner, or the rider of a bicycle. It is difficult to see at a glance how working regulations are to be framed to meet these extremes. Meanwhile, as will be seen by a paragraph which appears elsewhere, the fire offices have begun to move in the matter on their own account.

Some Rules of Law.

A good many striking rules of law, and some of simple justice, are to be noticed in a good report of the proceedings in the High Courts on almost any day. Accidentally last week we came across, in a judgment on a trade-mark case, two really startling pronouncements that went far to bear out the familiar definition of the common law of England as consisting of "organized common sense." The worst of it is, in a general way, that the organization overlays the common sense. In this case, even, the Judge had to complain that a lot of time and money had been wasted in the presentation of a few very simple contentions before the Court; and when he proceeded to deliver judgment, it was merely to apply to the particular issue the two general principles that "nobody has any right to "represent his goods as the goods of somebody else:" and, "a man must be taken to have intended the reason-"able and natural consequences of his acts." What a wonderful thing it is that business men should need the expensive assistance of the High Courts to apply such rules to their own proceedings!

Another exceedingly interesting judgment, delivered on Thursday of last week, was that in the so-called "cordite" case, which contained elements of instruction for all patentees. In this case, the plaintiffs, the Maxim-Nordenfelt Guns and Ammunition Company and Mr. H. S. Maxim, sued Sir William Anderson, Director-General of Ordnance Factories, to recover damages for the infringement of the "maximite" patent by the Government manufacture of "cordite." The question at issue was the always interesting one of what constitutes an "equivalent" in the eye of the law. Most inventors know a good deal about mechanical equivalents; but when it is a question of chemical equivalents, the fountains of the great deep of expert opinion are unsealed. In this case, Mr. Maxim patented a new propulsive powder—using the word in the ordnance, not in the physical sense—composed of gun-cotton mixed with nitro-glycerine and "castor oil or other suitable oil." The preparation of the defendant was a compound of nitro-glycerine with gun-cotton and vaseline. The plaintiffs' case was that their patent covered every possible mixture of gun-cotton, nitro-glycerine, and any suitable oil. The defence was that the claim for the use of castor oil or other suitable oil does not cover the use of vaseline, which is not an oil, and in nowise resembles castor oil; and also that a powder mainly composed of nitro-glycerine, with a small proportion of gun-cotton (maximite), is not the same thing as a powder composed chiefly of gun-cotton with a modicum of nitro-glycerine (cordite). Hence there was a very pretty puzzle over which of these ingredients was to be regarded as equivalent to the other, since, to make the difficulty more confounded, either combination would answer the same purpose. Mr. Justice Wright's method of approaching this tangle, was a model of the form of reasoning known as "proceeding from the known to the unknown." He took the question of the oil first. Is vaseline an equivalent, for the purposes of the patent, of castor oil or other suitable oil? Taking the words in their ordinary sense, without any aid from extrinsic evidence, the Judge thought the

word "oil" would mean fatty—that is to say, vegetable or animal—oils, but might include mineral oil. "Then the "question would be whether the context requires one or "the other interpretation. Having regard to the context, "I should think, as a matter of construction, that the "expression 'suitable' ought to be held to mean suitable "as having relevant qualities similar to those which the "specification indicates as the advantageous qualities of "castor oil, because otherwise there would be no standard "to which the word 'suitable' can be referred." The plaintiffs had claimed castor oil because, among other things, of its suitability for their purposes, by reason of its containing oxygen and being soluble in acetone. Mineral oils and vaseline do not contain oxygen, and are insoluble in acetone. They are not, therefore, held to be comprised within the selection of those oils which the language of the specification would suggest as suitable. On the question of proportions, the Court held, for reasons stated, that nitro-glycerine and gun-cotton are not the same thing as gun-cotton and nitro-glycerine.

We are not concerned with the particulars of the composition patented in the particular case under consideration, but only to draw from the judgment the general lesson for patentees, that when a specification describes a combination in certain proportions, these must not be largely departed from if the patent is to be held valid. The Judge's words on this point are: "Plaintiff's specification, even if not "limited to about 16 per cent. of nitro-glycerine, ought to "be read as describing a powder in which gun-cotton is the "main ingredient; and, if that is so, the defendants do "not infringe it. And if it is not to be so read, then I "think it is imperilled on another ground, because it "must be read as covering a very wide range of propor-"tions, many of which are proved to be useless, and among "which the selection of the useful proportions is proved to "require extended experiment, research, and discovery." In other words, the plaintiff is expected to know what he wants to make, and to stick to it.

Employers' Liability in Operation.

Just now, when the subject of employers' liability for injuries to workpeople is before the public, instances showing the actual working of the law are worthy of particular notice. Two cases reported in last Friday's "Times" are instructive in different ways. At the Lambeth County Court, Judge Emden had before him the case of *Wheatley v. Weeks*, in which the plaintiff, a youth, sued through Henry White, as his "next friend," to recover damages for alleged personal injuries. His case would not stand investigation; and in the witness-box he confessed that he had concocted the material points in the evidence. Thereupon the Judge made some strong remarks upon the way in which the case had been prepared by the plaintiff's Solicitor; and he ordered the "next friend" to attend, so that the Court might come to a decision as to the costs. When the time came, however, there was no such person forthcoming. The plaintiff's Solicitor's clerk appeared, and confessed that he had made use for this purpose of the name of a man who was temporarily staying at his house, and whose actual whereabouts he did not know. Judge Emden was very wroth at this, and pointed out that "the "address of the next friend as given to the Court was "intended to be that of a person of sufficient substance to "be able to pay the costs of the action should plaintiff "fail." In this instance, if the Court had had the power, an order would have been made for plaintiff's Solicitor to pay the costs. It appears, however, that solicitors are not amenable to County Courts as they are to the High Court. In the circumstances, therefore, the formal order was made that the "next friend" should pay the costs—which really meant nothing at all. Obviously, any new law of employers' liability should be safeguarded against abuses of this character. The second case may be cited as showing that, under the existing law, workmen are not so destitute of protection as is sometimes pretended. It was in the City of London Court, and was brought by a shipwright against his employers to recover £350 as compensation for the loss of his left eye, which was destroyed while he was cutting a rivet out of a ship in the docks. The plaintiff's case was that the piece of metal which did the mischief was from the chisel supplied to him by his employers; while the defendants alleged that it came from the rivet. They also pleaded that every possible precaution was adopted to prevent any accidents happening. Good tools were supplied to the men; and if the one in question was defective, the fact was not known to the defendants or to anyone for whom they were responsible. The point was clearly a difficult one; and Mr. Commissioner Kerr, who disposed of it, admitted its importance. He came to the conclusion defendants had been guilty of negligence, and condemned them to pay £300 damages. It was certainly a "hard case" in more than one sense.

WATER AND SANITARY AFFAIRS.

We find it announced that the vacancy in the representation of Whitechapel at the London County Council, caused by the retirement of the Progressive member, Mr. Catmur, is to be the subject of a contest fought solely on the Water Question. If this question were rightly understood in Whitechapel, we should say that Mr. H. L. W. Lawson, the Progressive candidate, would stand a very small chance of being elected. But perhaps Mr. Lawson himself does not quite understand this intricate problem. If he does, how are we to account for his telling the Whitechapel people that during the past two summers a water famine had visited the East-end, and to prevent a renewal of such a disgraceful state of affairs the County Council proposed to acquire the control of the water supply? This is admirable. The County Council having, by their factious conduct in Parliament, themselves caused what is described as the "water famine," persist in laying the responsibility of that event on the East London Company, and are represented as the authority specially qualified to take charge of the water supply so as to prevent any deficiency in future. Does Whitechapel read "The Times," or why does it fail to remember how the leading journal cited facts concerning the water famine in proof that the County Council could not be trusted with the command of the supply? We have on former occasions complained, and must still do so, that no public question has been so entirely misrepresented as that of the water supply of London. Old figments are still repeated as if they had never been controverted, though the errors have been completely exposed, both by "The Times" and by Governmental investigation. We shall see to-day what will be the action of the County Council in the election of a Chairman for the coming year. The Progressives evidently have some distrust as to their reception by the ratepayers in 1898, and would like to have it appear that if they have done amiss they are no worse than the Moderates. Let us hope that, among other things, the Water Question will be better understood a year hence than it is now, and also that the peril into which the Progressives are leading the ratepayers will not be overlooked.

It is a little singular that the rights of the Water Companies had so much weight with Mr. Campion, in deciding that the promoters of the Amalgamation Bill had not complied with Standing Orders. The Examiner spoke of the Bill as an attack on the Companies, and when assured by Sir F. Dixon-Hartland that this was not the case, he remarked that it attacked their possessions. Of course, no attack could well go farther. But the Companies were not present to complain that any of them were in any degree prejudiced by the lack of notice in November. The London County Council objected that the Bill should not have been introduced as a public measure, but should have been brought forward as a Private Bill, with the usual statutory notices. Mr. Cripps gave a sort of hint as if a similar objection applied to a London Water Bill brought forward by the Government. It might indeed be pleaded that the Amalgamation Bill was as much a public measure as the Water Board Bill of last session, and had as good a claim to an exemption from the rules applicable to a private measure. The Purchase Bills of the County Council stand on a different footing, as aiming at direct acquisition, and proposing terms distinctly hurtful to vested interests. The attitude of the Government has been fair towards all parties in this matter; and the conduct of Mr. Chaplin has evidently been actuated by a desire to arrive at a correct conclusion. Another meeting took place yesterday afternoon between Mr. Chaplin and the London Unionist members, with reference to the County

Council Water Bills, entered for second reading on Thursday. The interview was private, and the result had not transpired at the time we went to press; but, prior to the meeting, there was a general expectation that the proceedings this session would not go much beyond a further inquiry into the conditions of the supply, and some consideration as to the effect of purchase upon the rates.

The results of Mr. Dibdin's researches into the constituents of the London Water Supply have been presented to the Society of Chemical Industry in the form of an ably written paper, which has been made the subject of a discussion during part of one evening and the whole of another. It cannot be said that the character of London water has greatly suffered by the criticism to which it has thus been exposed. The micro-filter, devised by Mr. Dibdin, affords a new and valuable means of testing the quality of a water; but under this rigorous and minute mode of investigation, the supply furnished by the London Water Companies is found to be really very good, though in the opinion of Mr. Dibdin it might be better. We are getting so refined in our notions, that we are in danger of concluding there is nothing to be had that is really fit to eat or drink. Not even the water drawn from the deep chalk wells of the Kent Company will at all times meet the requirements of the new standard. Mr. Dibdin states that *anguillulæ* are occasionally present in the Kent water, from which he is quite ready to infer that there is something not altogether satisfactory in the treatment which the water receives at the works, though the filter-beds cannot be blamed, as none exist there. Concerning the Companies generally, Mr. Dibdin conceives that they require stricter supervision than prevails at present. His idea is that the public are "not sufficiently protected" in respect of a regular and careful examination of the water. Let the supply be in whose hands it may, he would strongly advocate rigorous inspection of the water by examiners appointed by an independent body. There is much of this already; and we apprehend that, if it would give satisfaction to the public, the Companies would not object to an extension of the system. That a pretty keen watch is being kept even now appears by a passage in the last monthly report by Mr. Crookes and Professor Dewar, where it is stated that these Chemists, on a day in January, found that a well belonging to one of the Companies contained a greater number of microbes than accorded with the usual high quality of the filtered supply. A serious warning was then conveyed to the Company's Engineer; and the next sample, taken within 48 hours, proved that the water had resumed its normal condition. But the practical point arrived at by Mr. Dibdin is thus expressed—that if the present London supply was softened before distribution, it would be every whit as reliable and good as a supply brought from Wales. At the same time, the County Council Chemist was constrained to say he was aware that this view did not meet the approval of many persons who had set their minds on a scheme for bringing Welsh water to the Metropolis. But we apprehend that the ratepayers of the Metropolis will be glad to find that so eminent an authority, armed with his inexorable micro-filter, only asks that the water, filtered substantially on the present system, shall be carefully watched and duly softened. Even this will cost something; but if the Companies are made to pay for it, nobody else need complain.

The Russian Petroleum Industry.—In order to further develop the Russian petroleum industry, and to enable it to better meet foreign competition, the Russian Government have reduced the oil freight rate on the Transcaspian Railway from 19 kopeks to 9 kopeks per pood. As in 1895, petroleum products of the value of 50,000,000 roubles were transported by this railway from Baku to Batoum, this reduction will mean a saving of 5,000,000 roubles a year to the oil trade.

The Gas Wells of America.—It has for some time past been rumoured that the gas wells in the United States are giving out. In Pennsylvania, no one knows exactly how much is done with natural gas, for records are not uniformly kept. Such as there are show that 22 iron and steel works and 35 glass-works, at least, are carried on in that State by natural gas. Some 250 other establishments are known to use natural gas; and more than 160,000 domestic fires in the State are supplied with natural fuel. But the pressure is diminishing, and the supply generally is slackening. From Indiana, where it was once thought the supply of natural gas was practically inexhaustible, it is now sorrowfully admitted that a period of decline has been entered upon. In Illinois, the production for the year 1895 was only half what it was in 1894.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 554.)

A FURTHER considerable fall in prices was not unnaturally the upshot of movements in the Stock Markets last week. At the opening, things were fairly firm; and the general tendency was steady. But business remained very slack; and the tone fell dull. As the week progressed, there was from time to time some little rally; but after each check, greater flatness prevailed. The weakness of the Continental Markets exercised a strong adverse influence; and the closing prices were mostly at their worst. As against the depression caused by affairs in Eastern Europe and in South Africa, there was little to mitigate the position; but rails had a ray of sunshine. The Money Market was fairly easy; but, of course, with affairs in their present position, great caution prevails. Business in the Gas Market promised at first to be very quiet; and in the general slackness, there was a move to put down prices. But this seemed immediately to bring in buyers; and stocks were well supported with more active business. Gaslight "A" was prominently in view here. It was sluggish at first; and on Wednesday it dropped to 313, with one point knocked off the quotation. It then rallied briskly; and dealings were active right up to the close—the final mark being 315¼. The secured issues were only very moderately dealt in; and they showed no change. South Metropolitan, too, was rather easy for some time, but finished brisker and better. Commercials were quite quiet and featureless. The Suburban and Provincial division were more active on the whole; but transactions were for the most part in Brentfords, which were steady and unchanged. The quotation of British advanced half a point. Among the Continentals, Imperial opened in better favour, and was quoted 2 higher. Several times in the week it changed hands as high as 215; but the closing prices were not quite so good. European was lowered a fraction; but nothing was done at the reduced figures. Among the rest, the only change was a slight fall in Belgrano. The Water Companies remain very stagnant. Transactions were few; and the only variation was in Lambeth, which receded two points.

The daily operations were: Business in Gas was very tame at the opening; but there was a rally in Imperial Continental, which recovered 2. Great quietude prevailed throughout Tuesday—prices ruling steady generally; but European fully paid was ½ lower. On Wednesday, the tone was dullish; and Gaslight "A" was put down 1. In Water, Lambeth 10 per cent. fell 2. There was a revival of activity on Thursday; and prices were better. British rose ½; but Belgrano receded ¼. Business on Friday continued fully as active—transactions in Gaslight "A" being very numerous; but quotations did not make any change. Saturday was perhaps the busiest day of the week; Gaslight "A," South Metropolitan, and Imperial furnishing plenty of transactions. Prices in the first two stocks showed out stronger; but no variation was made in the quotations.

ELECTRIC LIGHTING MEMORANDA.

High-Voltage Lamps—No Improvement of Incandescent Electric Lamps—The Case of Worcester.

IT is stated in the "Electrician" that the new high-voltage incandescent electric lamps for the current year exhibit considerable improvement upon those hitherto available. A number of patterns of so-called 1897 high-voltage lamps are described and illustrated by our contemporary; but in only one or two of these is there anything like a positive change of arrangement of the carbon filament to be distinguished. The adaptation of the typical incandescent lamp to 220 or 230 volts instead of the usual 100-volt service appears to be still merely a question of proportionately increasing the length of the filament. With this object, some makers double the filament; and a very few risk the expedient of making a single filament of double the usual length or thereabouts. Our contemporary has never accepted the double-filament lamp as being anything more than a makeshift device, and is still constrained to declare that, though it appears to be the actual standard type, it must only be a transitional form. Evidently, it is argued, the cost of a two-filament lamp must be greater than that of a single-filament lamp, other things being equal. We do not see that this consideration need weigh too much with the lamp makers. In the interest of electricity supply, the lamp is merely a means to an end; and the only proper way in which the developments in the matter of voltage of both generating stations and lamps can be of mutual assistance is for the suppliers of current to also supply the lamps either gratis or at a uniform low charge. Doubling the voltage of the current may be of advantage to the supply station, but it is of no direct benefit to the consumer. If, therefore, the interest of the undertakers prompts the use by the consumer of a special description of lamp, they ought to put him in the way of helping them in this regard in a manner to which he could not take exception. The consumer must perceive that, in the long run, everything that promotes the advantage of the undertaking will redound to his advantage also; but, meantime, the experiment should not be carried out at his expense.

Looking at the question of the high-voltage lamp from this point of view, the decision of how best to arrange the filament is one for the makers alone. It does not follow that a lamp with two filaments must be more costly to manufacture than a lamp with one filament of double length, or in other ways adapted to withstand the increased pressure. The main thing to be observed by the user is that there is no difference in efficiency between lamps of high or low voltage. In other words, the real improvement of incandescent electric lamps is still to seek. Our contemporary confesses that representative makers continue to recommend efficiencies of from 3½ to 4 watts per candle, at all voltages. This being the case, the question of the economy of high or low voltage obviously remains one for the undertakers alone; there being no direct reason for troubling consumers in the matter. There is no apparent cause, in the nature of things, why the standard of efficiency of the incandescent electric lamp should remain at 4 watts or thereabouts per candle; but such is the case. It does not signify whether the electricity thus converted into light is at 100 or 230 volts, or whether the lamp which effects the conversion has one filament or two. Nor is the result affected by the manner of disposition of the active filament, which may be coiled or waved, arranged in a fancy pattern or severely plain. The lamp may be turned upright, laid on its side, or fixed upside-down; it may give a light equivalent to any number of candles from 8 to 250—and in every case it will consume, on the average, 4 watts per candle. For practical purposes, therefore, this figure is to be reckoned with as one of the constants of electricity supply; and it is, fortunately, an easy unit to remember and work with.

The high-voltage lamp and the Brighton system of differential charging for current supplied appear to exhaust the list of advantages with which the electricians of 1897 have to face the world, as compared with the facilities they possessed in earlier years. We have shown on previous occasions that the Brighton system cannot be credited with universal applicability; and even the "Electrician" confesses that its fundamental principle of favouring the small tradesman who lives over his shop would not work out well in the cases (say) of the great London supply companies. Our contemporary, however, has just discovered a case in which it thinks the Brighton system would answer admirably, and in common justice we must place the opinion on record. The case is that of Worcester, where, it will be remembered, about double the usual capital outlay was incurred by the Corporation in order to utilize a water-mill for generating electricity. A very complete equipment was laid down for producing the current by either steam or water power; and, naturally, the very first year the station was started was one of drought, so that the water-power plant proved of little or no service to the town. Last year the conditions were slightly more favourable; rather more than half of the total number of units of electricity generated being credited to the turbines. The business of the station is so split up, however, between public lighting, supplying motive power to the water-works pumps, and the private connections, that the working results can be criticized from several different standpoints. The Engineer of the station (Mr. Ruthven-Murray) has just issued a report upon the year's working, in which a strenuous attempt is made to put a fair aspect upon what is plainly a very disappointing state of affairs. There has been a gross profit of £1602; but as the sum of £3218 had to be provided for interest and sinking fund, the rates will have to make good the deficit of £1616. In order to do any more business in the city, a further capital expenditure of £8834 is called for. Mr. Murray's analysis of the working returns is directed to bring into prominence the extravagant proportion that standing charges bear to the cost of working. It is made out that every 8-candle power private lamp connected must return 7s. 5½d. to cover its proportion of the former charges, to do which it should be in use for about an hour and a half daily, at the uniform charge of 5d. per unit. After this it would begin to pay. It may here be pointed out that an average return of more than 7s. 6d. per 8-candle lamp per annum is only touched by a few very successful electric lighting undertakings. Mr. Murray, however, contends that it will be advantageous to the Worcester concern to make a radical change in the method of charging, in order to meet the inequalities of the case; and the "Electrician" agrees with him. "Never, in our opinion, was there a case where a uniform tariff was more hopeless, and where a well-arranged differential system, such as the one devised by Mr. Arthur Wright, more completely met the needs of the case." This is, indeed, matter of opinion. The Worcester Town Council have to consider Mr. Murray's report at their next monthly meeting; and though it is impossible to entertain a high opinion of the practical wisdom of the body that embarked upon such an ill-advised venture, it will be strange if the Corporation are brought to see salvation in any system of juggling with the rates of charging. What is the matter with the Worcester undertaking is mainly the hopeless capital account—that is to say, the whole scheme. The ratepayers have been beguiled; and they must now abide by the consequences.

Another Explosion of Acetylene.—According to the Paris "Journal" of the 27th ult., an acetylene apparatus, employed in lighting the Béthune Bazaar at Bruay, exploded and set fire to the establishment, which was totally destroyed in an hour. Fortunately no one was injured.

IN DEFENCE OF LIBERTY AND PROPERTY.

The Liberty and Property Defence League is one of the institutions that might be included in the category of those things of which a once-popular lyric remarked that while sometimes heard about, they are "very seldom seen." The League has been in existence 14 years, and issues annual reports which are usually noticed in the "Journal," for the criticism they supply of some of the more occult Socialistic schemes of legislation brought before Parliament regularly every year. The Secretary sends occasional letters to the newspapers, commenting upon passing events in the industrial world from the anti-Socialistic standpoint. But, unlike the subjects of its official animadversions, who frequently parade the streets and parks of the Metropolis in the guise of "an army with banners," the League rarely materializes in the public view, which is rather a pity. An American sage has observed that to attempt in these clamourous times to do an extensive business without advertising is "like winking in the dark—you may keep up a powerful winking, without anybody becoming aware of it." So with the conduct of or attack upon these semi-political "causes" that appeal today for recognition and support by the general public. Socialism, Collectivism, Municipalism, and other experimental developments of party and industrial politics, cry aloud in the newspapers and at the street corners; and is not of much use for those superior persons who know the hollowness of such cries to stay at home and write letters to this effect. It has been remarked that one of the conditions attaching to the holding of a chair of Political Economy at one of our Universities ought to be the spending of six months of the year at dock work; and the idea is far from being merely grotesque. Count Tolstoi does a great deal more than this. It is not that the world is destitute of self-made "Labour leaders" undoubtedly sprung from the ranks of those whom they profess to represent. On the contrary, the public life of the modern community is only too full of them. They are in Parliament; they are aldermen and members of County Councils, Municipal Corporations, and so forth; they occupy seats on the Bench; they edit newspapers; they are in government offices; and they preach from pulpits. Many of these self-made notables are excellent persons; and all the world unites in speaking well of those who have been able to do so much for themselves. But the sorrow is that they do not represent Labour as it is. Practically, they constitute a professional class, with individual and collective interests not necessarily identical with, and often widely different from, those with which they started in life. "The Priest when he has said a mass, forgets that ever Clerk he was." One does not often find that the man who has thriven, in any condition of life, is inspired with the keenest sympathy for the state of those whom he has left behind; and it is certain that the circumstance of his having once been a day labourer himself, is no warranty for a man knowing any remedy for industrial ills, or being more solicitous than men of a different origin to cure them. It is the economist's business to ponder these things; and it would be a wholesome corrective of theoretical errors if he were himself to condescend to try how existing systems actually work.

To return, however, to the immediate subject. The Liberty and Property Defence League came out into public view last week at the Westminster Town Hall, on the occasion of the fourteenth annual meeting, when the chair was taken by M. Paul Leroy-Beaulieu, a distinguished French economist, who was supported by the French Ambassador and a number of eminent personages of several nationalities. Commend us to a Frenchman of science of any description for a lucid, picturesque, and epigrammatic statement of the character and aims of his speciality! M. Leroy-Beaulieu's oration—in his own language—upon the subject of Liberty and Property was admirable. So eloquent was the speaker, so logical his argument, so persuasive his conclusions, that while reading the report of his address one would never imagine him to belong to the nation which invented the idea of Liberty, *Equality*, and Fraternity, and is actually attempting to protect its own industrial and commercial interests by means that outrage every canon of political economy. M. Beaulieu observed that the Collectivists blindly wish to suppress the two forces of liberty and property at once; while the State Socialists wish to reduce them to such a condition of anæmia, that they will no longer continue to act. "The future they promised was a shade of property; if they succeeded in their efforts, there would be at the end of one or two generations but a shade of industry and a shade of prosperity." Most true; but how is it that neither elective legislative bodies nor autocratic governments will take counsel with the professional economists respecting points of practical policy? What industry and commerce, as well as liberty and property, have most to fear is not the dreams of confessed Collectivists or Socialists—visions which the possession of a little personal property usually dispels—but the mistaken preferences of states and municipalities for certain interests as compared with others. Thus, on the Continent, governments imagine that they owe certain favours to particular industries, while others are regarded as undeserving the least attention from the State. Some favoured industries are, therefore, protected against foreign competition and fed with bounties, while others are oppressed by the most onerous burdens. Though M. Leroy-Beaulieu did not give any examples of this mischievous

economic heresy, we can mention perhaps the most conspicuous of them all—the artificial lighting industry in all its various developments. In France, the trade in every kind of light, from the match to the electric lamp, is regulated and taxed to the uttermost, as though indulgence in illumination after dark were an evil to be discouraged by every means at the disposal of a paternal Government. The result is that lighting oil, gas, and electricity are all prevented from subserving the public convenience as they do in other and more wisely administered communities. Whole groups of industries ancillary to the lighting services are in this way repressed or aborted; and the country suffers indirectly far more than anybody suspects.

Proceeding, M. Leroy-Beaulieu referred to the extension of the powers of Municipal Councils—"bodies often incompetent and incoherent, and badly controlled financially"—as one of the perils of the present day. "Those who urged the extension of the duties of the State, the creation of monopoly for the State, did not see that political liberty was threatened as well as economic or commercial liberty. It was regrettable to see some statesmen who called themselves moderate receive these projects so well, and sometimes protect them with their patronage. . . . It was evident that all this State Socialism was nothing but a road to Collectivism." Excellent sentiments, which may be commended to the notice of those members of Parliament who are disposed to regard the professed affection of the London County Council for Welsh water as a pardonable weakness devoid of questionable motive. Happily, so long as the Liberty and Property Defence League exists, and counts among its staunchest supporters such champions of economic verity as Sir Frederick Bramwell, there is no doubt that the "true inwardness" of Welsh water and similar curious schemes will continue to be exposed.

It were greatly to be desired, however, that the truths of political economy were better taught among the people—not as being the care of such voluntary associations of capitalists and large employers of labour as the Liberty and Property Defence League, but as constituting the safeguard of the economic rights of the many. For there are not two systems of political economy, one for the rich and another for the poor; but only one valid system, deduced from the collected experiences of the workaday world from the beginning. The point requires pressing, because it is this character of such studies that is so seldom recognized on the popular side. We were glad to notice some time since that the subject of the teaching of economics in a manner and to a purpose that can be "understanded of the people" was brought before the Society of Arts by Mr. Hewins, in an interesting and useful paper. Mr. Hewins described the establishment of the "London School of Economics" at 9, John Street, Adelphi—a praiseworthy undertaking of which we regret to say we had never heard. It is to be hoped that all those who are making a systematic study of gas manufacture, or any other technical subject pointing to the ultimate employment of the student in a position of responsibility and influence in the industrial world, will not neglect the opportunity here provided of mastering the elements of this science. It is not, as Mr. Hewins observes, that people with work to do in the world are materially benefited by the study of Mill or of any other text-book writer. He believes rather that "most educated people would admit the importance and the desirability of economic teaching so far, that they would prefer to know rather than not to know the economics of the questions which they have to deal with in the practical business of life, or in which public events or private reading arouse, it may be, a passing interest. . . . It is impossible for everyone to undertake with profit a course of instruction in abstract economic theory. But much fruitless discussion of some absurd proposals might be avoided if the generalizations of that science could be widely disseminated. Economic history—particularly that of England in relation to foreign countries in modern times—is not only valuable as an educational force, but is full of suggestiveness and warning. There is no branch of public or municipal work which would not gain in efficiency if officials were thoroughly trained in some one or more branches of applied economics—such as finance or statistics." Economics, that is, should be studied as a branch of intellectual equipment, not as a subject to be "professed."

Mr. Hewins's paper was discussed by Mr. Martin Wood and Sir Owen Roberts; the former contending for the great practical value of a grounding in economic science, for lack of which many able public men go astray. "Rightly understood, it covered a very large proportion of the whole field of human exertion; and it appealed to the faculties common to the great majority of mankind. Its importance it was scarcely possible to exaggerate. Technical and scientific instruction was highly important; but even the results thus gained could not be practically and usefully applied without a due acquaintance with economic principles." Sir Owen Roberts humorously suggested that "the question of compulsory and free education for members of Parliament in this subject might well be considered, with possibly a qualifying examination before election. He thought there would be a considerable number of exclusions as the result of such a test. He should be rather interested to see what sort of an examination certain prominent statesmen would pass. He was not at all sure that a similar examination for the London County Council would not be productive of good results." Seriously, the same speaker pointed out that, unless there is more popular economic teaching in the future than there has been in the past, disastrous consequences may ensue from the improper treatment of great questions by the rising generation.

In connecting the subjects of the operations of the Liberty and Property Defence League and the teaching of economics, we have placed the former in conjunction with the most hopeful means of furthering their object. If, as the phrase goes, "eternal vigilance is the price of liberty," then instruction in economic truth must be the enduring protection of property. Should the idea once get abroad that the care of liberty and property is only an affair of the rich and powerful, the days of both would be numbered. Mankind can be trusted to take care of their own, but not always to protect either the liberties or the goods of others.

OBITUARY.

The death is announced, at the age of 71, of Mr. Isaac Rist, of Brentwood. The deceased was the Chairman of the Brentwood Gas Company.

Mr. Henry Tapscott, whose death is announced from Exeter, after a somewhat long illness, was a Director of the Exeter, Topsham, and Budleigh Salterton Gas Companies.

By the recent death of Mr. H. G. Warwicker, of Maldon, vacancies have been created on the directorates of the Maldon Gas and Water Companies. The deceased, who was 77 years of age, was one of the oldest and most respected business men in the district.

PERSONAL.

Mr. J. A. Fielding, of Ruabon, has been successful in obtaining the appointment of Manager of the Bastia (Corsica) Gas-Works, applications for which were invited in the "Journal" for Jan. 12, under No. 2781.

It is quite likely that Mr. W. Watts, of Oldham, will, after all, secure the position of Engineer for the Langsett reservoir of the Sheffield Corporation. Last Tuesday the Water Committee decided to recommend the Council to appoint Mr. Watts at a salary of £800 a year, rising by annual increments of £100 to £1000.

At the ordinary meeting of the Institution of Civil Engineers last Tuesday, Mr. C. E. Botley, the Engineer and Manager of the Hastings and St. Leonards Gas Company, and Mr. W. A. P. Tait, B.Sc., of Messrs. Leslie and Reid, of Edinburgh, were transferred to the class of members; and Mr. C. F. Botley, assistant to his father at Hastings, was elected an associate member.

Mr. John Orwell Phillips has retired from the Board of the Ottoman Gas Company, Limited, on account of ill-health; and the vacancy thus caused has been filled by the election of Mr. Henry Ward Andrews, who for nearly seventeen years was the Company's Engineer and Manager in Smyrna, and since his return to England has occupied the position of their Consulting Engineer.

Mr. R. Brown, of Hastings, has been appointed Engineer and Manager of the Cambridge Gas Company, in succession to Mr. O. J. Weeks, whose resignation, through ill-health, was announced a short time ago. Mr. Brown has been fourteen years in the service of the Hastings and St. Leonards Gas Company—first under the late Mr. A. H. Wood, and for the past ten years under Mr. C. E. Botley, M.Inst.C.E. Mr. Brown will take up his new duties at the end of April.

Estate duty has been paid on £117,546 as the net value—the gross being £122,247—of the personal estate of the late Mr. Thomas Mashiter, whose death was announced in the "Journal" on the 8th of December last. The name of deceased was formerly Helme; and for about forty years he was a Director of the East London Water Company. He has bequeathed to his son, Francis M. Helme, in trust, £10,000 of the Company's stock; and in expectation that the London County Council will acquire their works, he has left to his son Herbert, who is a Director of the Company, a sum of £4000, upon trust, in compensation for the loss of his directorship in that event.

The Insurance Companies and Acetylene.—The following rules have been drawn up by the associated insurance offices respecting acetylene: (1) The storage of calcium carbide, liquid acetylene, or acetylene, and every apparatus, whether portable or otherwise, for the generation of such gas must be only in a building detached at least 10 feet at the nearest point from every other building. (2) Suitable valves or devices for controlling the pressure of the gas must be placed inside the detached building, and a cut-off provided between the building and the one supplied with the gas. (3) In addition, the piping in the building in which the gas is used must be provided with a pipe outlet into the open air, controlled by a safety device so arranged as to let the gas escape outside the building whenever the pressure exceeds 4 oz. to the square inch. The offices have agreed not to admit liability for explosion of acetylene gas occurring elsewhere than in the building which is, or the contents of which are, the subject of the insurance.

NOTES.

The Compressibility of Soils.

A suggestion has been made by Herr Rudolf Mayer, in the "Schweizerische Bauzeitung," of an apparatus for measuring the capacity of any given soil to support a load, such as the pressure of a pier or foundation. The device consists of a plunger fitting loosely in an open-bottomed cylinder, so arranged that the bottom of the plunger rests on the ground, while it may be loaded on top with weights. A large base-plate prevents the surrounding earth from being forced up around the plunger; while the depth to which the latter sinks upon the application of a given weight, is measured by the rise of a column of mercury, forced by an auxiliary plunger. Closer measurements of the movement of the plunger are to be made by a micrometer. It is objected to this device that it is little better than a toy—the plunger being only 20 centimetres in area; so that it is difficult to believe in the reliability of indications secured by this means. At the same time, the question of the compressibility of soils under a load has not been well worked out; and a careful observer, with suitable measuring instruments, might be able to collect useful data in this regard. Any numerical expressions purporting to represent the results of experiment in this field, would require to be interpreted with great judgment.

Coke in Carborundum Manufacture.

Mr. Francis A. Fitzgerald recently delivered a lecture to the Franklin Institute on the manufacture and development of carborundum at Niagara Falls. This was practically the story of the improvement of the electric furnace for a particular application. The electric furnace was originally a carbon arc surrounded by the substances upon which it was desired to act, and a refractory casing. It has now, in the hands of Mr. Acheson, become an incandescent furnace. For this purpose, there was introduced into the furnace a core of granulated coke, which formed a continuous electrical connection between the carbon terminals. These furnaces have been gradually increased in size until, in 1895, they were built 9 feet long, 1 ft. 11 in. wide, and 1 ft. 9 in. deep, with a coke-core 8 feet long. This core was 9 inches in diameter. At Niagara, the coke used in making the cores is first broken into nuts, and twice screened. The other raw materials of the carborundum manufacture are sand, sawdust, and salt. The present furnaces are 16 feet long, 5 feet wide, and 5 feet deep. The terminals which project through the end walls for introducing the current each consists of 60 carbon rods, 3 inches in diameter. The furnace and its core of coke and the other materials are built up afresh for every heat. The current is used at 185 volts pressure; and about 1000-horse power is taken through the furnace at this pressure. The connection is made by means of a salt water rheostat safely enclosed in a vat. When the current is first turned on, no apparent change occurs in the furnace for about half an hour. Then a peculiar odour is perceived, and carbonic oxide begins to come away. After three or four hours, the walls and top of the furnace are completely enveloped by the lambent blue flame of carbonic oxide, formed by the combination of the carbon of the coke with the oxygen of the sand. During a single run, 5½ tons of this gas are liberated. At the end of five or six hours, the top of the furnace begins to fall in, fissures appear, and yellow fumes of sodium escape. At the end of about 24 hours, the current is cut off, and the furnace allowed to cool for a few hours. Then it is pulled down until the outer crust of amorphous carborundum is discovered. A cross-section of a carborundum core presents an interesting and beautiful appearance. It is very different in physical character from the original coke. Some nuts of coke retain their shape, but are quite soft; so that they can be squeezed between the fingers, leaving a mark like black lead. In fact, the high temperature to which the core has been exposed has driven off all impurities from the coke; leaving nothing but pure carbon, either amorphous or graphitic. From the core radiate beautifully-coloured carborundum crystals to a distance of 10 or 12 inches. A single heat of one furnace yields over 4000 lbs. of crystalline corundum. This is surrounded by a skin of amorphous carborundum. Other appearances which sometimes present themselves are considered to explain the formation of graphite from amorphous carbon. It has generally been supposed that, when amorphous carbon is subjected to a very high temperature, it becomes directly converted into graphite; but Mr. Acheson supposes that it first enters into combination with some other element, and then decomposes into graphite. Otherwise all the coke in the core would be converted into graphite, which is not the case. The carborundum is used for grinding.

Compressed Air Tramcars.

A paper on compressed-air as a motive power for tramway working, has been contributed by Mr. Herman Haupt to the "Journal of the Franklin Institute," the conclusion appearing in the February issue. From this statement, it may be gathered that in compressed air the electric "trolley" system of tramway working has a rival to be seriously reckoned with. There are motors of the former kind now running in New York, which make a trip of 17 miles with one charge of air. The reservoir capacity is 50 cubic feet; and the air is reheated as used. The system is described as cheaper, both in installation and in operation, than any other in use, whether for city or suburban service. A comparison is made with the trolley system, in which, to begin with, the range of electric transmission is limited to 5 miles, at 500 volts. Electric cars are usually provided with two 25-horse power motors; but a distribution of 25-horse power per car is all that is usually calculated upon at the station. The transmission involves many losses; and only a comparatively small portion of the power generated can be actually utilized at the rail. The effective duty of a system of this kind is only from 37 to 50 per cent. On the basis of a 5-mile double tramway, with thirty cars running at an average speed of 10 miles per hour, the trolley system would require 1500-horse power at the station, as against 900-horse power for air compressors doing the same work. The writer states that he prepared a close estimate of the relative cost of electricity and compressed air for a transmission of 5 miles from the power station of an elevated railroad, with trains running at one-minute intervals; and the electricity estimate, as checked by an electrical engineer, came out double that of air.

The Electrolytic Manufacture of Incandescent Gas Mantles.

It is reported that, as some compensation for the injury inflicted on the central station electric lighting business by the incandescent gas-burner, a day load for such establishments may in the future be found in the electrolytic preparation of Welsbach mantles. Hitherto, according to an electrical contemporary, there has been a difficulty in the way of electrically depositing the oxides of the metals of the rare earths in an adherent form. Herr Langhans has found, however, that if a hydroxide of these metals is first dissolved in a solution of one of its own neutral salts—say, the sulphate—or that of any other metal of the group, an electrolyte is obtained which yields an adherent, horn-like deposit of the hydroxide, which will bear rough handling. The process is carried out in a cylindrical vessel, provided with an anode composed of a thin cylinder of platinum. The mantle forms the cathode. The addition of a small quantity of nitrate is desirable. When sufficiently coated, the mantle is removed from the bath, washed, dried in air free from carbonic acid, and calcined gradually. The deposit obtained in this way may consist of the hydroxide of a single metal, or of a mixture, according to the constitution of the bath. An alcoholic solution produces a thicker deposit. The process appears to be beautifully simple and symmetrical; but why it should be preferable to the ordinary method of manufacturing mantles by simple dipping, and why central electric lighting stations should appropriate it as a help towards the solution of the problem of the unequal day load, does not appear on the surface.

COMMUNICATED ARTICLE.

THE USE OF ATMOSPHERIC AIR WITH LIME FOR THE PURIFICATION OF COAL GAS.

By S. Carpenter, of East Ham, Essex.

Questions having at times arisen as to the use of atmospheric air where lime is employed for the purification of coal gas from carbonic acid and bisulphide of carbon, I should like to offer a few remarks upon the matter, not with the view of instructing gas managers, but at the same time in the hope of benefiting some of them.

My advice to all who are interested in this subject is: (1) Do not allow any atmospheric air to pass up the ascension-pipes or go into any part of the hydraulic main. (2) Do not admit any air at the inlet of the condensers. (3) Do not allow air to get into the lime purifiers under any consideration; for if any should be admitted, it will interfere with the chemical action of the lime and the gas. The air oxidizes the hydrogen of the sulphuretted hydrogen, and sets it free, and at the same time fixes the sulphur in the lime. The air acts in precisely the same way on the gas in the lime purifiers as it does on that in the oxide of iron purifiers. If air is admitted into the purifiers to the extent of (say) from 1½ to 2 per cent., the lime is converted into pure sulphide of calcium, which has very little affinity for bisulphide of carbon. It must be converted into what the writer terms "hydrogenated" sulphide of calcium, which has in a high degree the power of absorbing that stubborn impurity bisulphide of carbon from coal gas. This impurity, or at any rate part of it, can be easily removed from coal gas if the lime purifiers are worked in the way the writer has described in his pamphlet on the "Purification of Coal Gas."

If air or any furnace gas, or the gas at the end of the charge where anti-dips are used, should be admitted into the lime purifiers, especially just before a box is thrown out of action, it will drive out of the lime the impurities which this material had previously extracted from the gas, and drive them forward into the gas which is being made. The air will act upon the lime in the purifier at work on the same principle that it acts on the lime in the box which is out of action for the revivification of the spent material it contains. These are the impurities which are given off when revivifying the foul lime. At the outlet of the purifier we get carbonic acid and sulphuretted hydrogen. (These were the only tests the writer could make.) These impurities are passed into a small vessel charged with oxide of

iron, so as to purify the air which had been contaminated with them when passing through the foul lime.

If at any time the chemical action of the lime should be interfered with—for instance, by an excess of air or furnace gas—there will be a very considerable rise in the sulphur compounds other than sulphuretted hydrogen; and from the results of the sulphur test, instead of getting a white powdery ash in the crucible, there would be small flakes of sulphate of barium—showing that the chemical action of the lime had been interfered with by something more than the sulphur in the crude gas. In the event of any interference such as has been stated, this is very probably the condition in which the lime would be in the purifier. Instead of being sulphide of calcium, we should obtain calcium sulpho-carbonate ($CaSC_3$); and by passing the gas through this, we should get into it thiocarbonic acid (also called sulpho-carbonic acid). To prevent eruption in the sulphur compounds other than sulphuretted hydrogen, do not admit any atmospheric air, directly or indirectly, to pass into the lime purifiers. Then the bisulphide of carbon in the gas will keep to about 10 to 15 grains per 100 cubic feet of gas, and there will be no trouble with the lime purifiers.

The writer has worked these purifiers for thirty years in the way described in his pamphlet already referred to, and with good effect. The following are some of the first results of the tests for sulphur in gas which had been purified in large purifiers by lime for carbonic acid and bisulphide of carbon in 1866:—

	Grains S. per 100 C. Ft.		Grains S. per 100 C. Ft.
Nov. 10	16·48	Dec. 1	15·00
,, 13	19·08	,, 2	15·27
,, 14	14·17	,, 4	13·67
,, 15	14·06	,, 5	14·03
		,, 6	16·03

There was no carbonic acid in the gas.

The following are the results of tests made in 1867:—

	Grains S. per 100 C. Ft.		Grains S. per 100 C. Ft.
June 9	12·21	June 15	14·28
,, 10	9·72	,, 16	16·89
,, 11	9·30	,, 17	16·50

There was no carbonic acid in the gas.

The writer worked lime purifiers from 1866 to 1896 in precisely the same way, and good results have been obtained in purifying gas from carbonic acid and bisulphide of carbon. There was no carbonic acid in the gas; it having been all taken out by the lime in the first purifier.

The only place where atmospheric air can be used without interfering with the purification of coal gas, where lime is employed for decarbonating the gas and removing part of the bisulphide of carbon, is at the inlet of the first oxide of iron purifier. From 1 to 1½ per cent. of air admitted there will be sufficient to keep the oxide in an active condition. As the result of practical experience, the writer has found that when the sulphuretted hydrogen makes its appearance on the top of the first oxide purifier, it is a good thing to pass a small quantity of air in at the inlet of the second purifier. If the air is used in the way described, the oxide will last in the purifiers for months instead of weeks. When preparing the oxide for the purifier, do not put it in too wet. If it is in this condition, it is very inactive in the removal of the sulphuretted hydrogen. The writer has found this by practical experience: When passing the air directly into the lime purifiers, the oxygen did not reach the oxide of iron purifier, so that the material did not derive any benefit from the air. When the purifier was opened, the oxide was wet, and very little discoloured, and this on the bottom tray; while the material gave off a strong smell, resembling that of acetic acid. The object of sending air directly into the oxide purifiers is to keep the material in a semi-rusty condition.

The Gas Consumption of Paris.—At the annual meeting of the Paris Gas Company, which is usually held towards the close of the present month, the Directors will have the satisfaction of reporting that the receipts for gas in the past year exceeded those for 1895 by 2,118,620 frs. (£84,745), or 2·69 per cent.; the figures for the two years being 78,757,716 frs. (£3,150,309) and 80,876,336 frs. (£3,235,054).

Spons' Architects and Builders' Price-Book for 1897, a copy of which has been forwarded to us by the publishers (Messrs. E. & F. N. Spon, Limited, 125, Strand), contains, in addition to a mass of useful memoranda and tables, a chapter on electricity, with complete specifications and "estimates on electric lighting installations carried out by the author." The arrangement of the matter in alphabetical order facilitates reference to any desired formula or memorandum; and there is a good index. The Editor (Mr. W. Young) has considerably improved the book, which has now reached its 24th edition.

The Coal-Fields of Mexico.—Considerable satisfaction has been caused in Mexico, says the "Financial News," by the discovery of what are said to be extensive coal deposits in the States of Michoacan and Jalisco, south of Lake Chapala. The coal, it is stated, is of good quality, and can be easily mined. The discovery of a vein of coal in the central part of the Republic so located that there are, as reported, no insurmountable difficulties in the way of cheap transportation to market, is, naturally enough, locally thought to be of incalculable value to the manufacturing interests already established.

TECHNICAL RECORD.

THE DECOMPOSITION OF HYDROCARBONS BY HEAT.

(*Continued from p.* 476.)

The investigations were next extended to trimethylethylene, for the following reasons: (1) It appeared incapable of direct conversion to benzene. If, therefore, it yielded less benzene than did hexane, a specific tendency on the part of the latter to direct conversion to benzene might be assumed. The two hydrocarbons, as a matter of fact, yielded equal quantities of benzene; and as they have not any long chain common to their structure, the formation of benzene cannot be traced to the splitting off of a primary simple grouping such as acetylene from both bodies, and subsequent conversion, by condensation, of the acetylene to benzene. (2) The formation of methane from hexane at 940° C. could not be harmonized with the products by reference to any simple reaction; while at lower temperatures, a terminal methyl group had been detached. It was interesting to trace the formation of methane from trimethylethylene, which could only split off one methyl group as methane unless the whole atomic linkages were loosed and destroyed. At lower temperatures, as a fact, only one methyl group was split off as methane; but at higher temperatures (935° C.), more than that proportion of methane was formed from trimethylethylene. (3) It was not conceivable that higher paraffins could be produced by simple rupture of trimethylethylene. The formation of closed-chain hydrocarbons from hexane appeared difficult, but possible. It was interesting to observe whether hydrocarbons which did not correspond to the ratio $3\,V = 4\,K + C$ were to be found in the residual gas. As a fact, they were so found.

Pure trimethylethylene, prepared by Herr C. A. F. Kahlbaum, was used. The first experiment was made with the middle portion of the tube at from 750° to 790° C. In 229 minutes, 77·5 c.c. were gasified, and 27·015 litres of gas were obtained. A dense stream of yellowish-white fumes was observed to leave the mouth of the furnace-tube; but after passing the condensing vessels, the gas was quite colourless. There was a heavy precipitate indicative of acetylene in the silver solution. The following was the percentage composition of the gas (air being eliminated by calculation): Hydrogen and hydrocarbons, 72·63; olefines, 26·88; carbonic oxide, *nil;* carbonic acid, 0·15; and nitrogen, 0·34. The analysis of the gas presented special difficulty. Much carbonic acid resulted on fractional combustion by Bunte's method; and a hydrogen determination could not be made. Hydrocarbons of unknown character were therefore present in the residual gases, as no carbonic acid results from a mixture of hydrogen and methane. Combustion over mercury, showed that hydrocarbons other than paraffins were present in the residual gases.

For calculating limiting values for the quantities of hydrogen and methane, it was assumed, first, that the whole of the carbonic acid formed in the combustion over mercury was derived from methane, which gave the highest limit for the methane, and a very low one for the hydrogen; and, second, that there was present the quantity of hydrogen which would give the hydrocarbons of the gaseous residue an oxygen consumption of 2·43 c.c. per cubic centimetre, which was the average value for the decomposition gases of hexane. The latter assumption gave the lower limit for the methane, and the higher for the hydrogen. The specific gravity of the dry gas was 0·749; and the limits for the mean molecular weight were 40·4 and 41·7. The weight of gas free from air was 25·528 grammes. The maximum weight for methane on the above assumption was 11·462 grammes; whereas the equation $C_5H_{10} = CH_4 + (C_4H_6)$ would account for 11·62 grammes of methane for the quantity of trimethylethylene applied. Therefore, the maximum value for methane is no greater than would correspond to the splitting off of one methyl group. The gaseous olefines amounted to 13·669 grammes, and the hydrogen to 0·15 to 0·63 gramme.

The following results were also obtained in this test: In the tube and tar collectors there were 23·57 grammes of tar, which proved quite free from unchanged trimethylethylene, as the first fractions distilled over at 80° C. It distilled fairly regularly up to 245° C., and left a residue of 1 c.c. of thick black tar. The tar dissolved completely in concentrated sulphuric acid, and therefore was quite free from the higher paraffins. On pouring the acid solution into water, a small quantity of resin separated out. The tar reacted vigorously with strong nitric acid; and a powerful smell of nitrobenzene—indicative of benzene in the tar—was observed. The specific gravity of the tar was 0·858. The distillate took up 0·971 gramme of bromine per gramme. A very small amount of distillate containing benzene was obtained from the paraffin oil tubes. The amount of acetylene, calculated from the silver compound, was 0·04792 gramme, or 41·27 c.c. The 50·925 grammes of trimethylethylene gasified yielded, therefore, products as follows:—

Olefines, gaseous	= 13·669 grammes.
Methane	< 11·462 ,,
Hydrogen	0·150 to 0·630 ,,
Acetylene	= 0·048 ,,
Tar, containing some benzene	= 23·570 ,,
Carbon	a trace.

The products of the decomposition resemble those obtained at a like temperature from hexane in the following particulars:

(1) In the average molecular weight of the olefines. (2) In containing small quantities of acetylene and benzene. (3) In the occurrence in the gaseous residue of hydrocarbons which do not satisfy the equation for paraffins. (4) In the quite subordinated formation of carbon and elementary hydrogen.

The chief difference lies in the character of the tar. That from hexane contains, in addition to unaltered hexane, only lower olefines; while that from trimethylethylene contains only olefine-like products of greater molecular weight than the original material. The difference is explained very simply. With hexane, the splitting up give groups stable in themselves; but with trimethylethylene, when methane has been detached, the higher molecular grouping which remains is unstable, and polymerizes to more complex groups. The absence of all higher paraffins in the tar from trimethylethylene is noteworthy, and the small extent to which the addition of hydrogen takes place at the lower temperature, is thereby well illustrated.

The next stage in the researches was the examination of trimethylethylene at a higher temperature corresponding to that of hexane at 940° C. The middle portion of the tube was maintained at 933° to 938° C. during the test; and 21 c.c. of trimethylethylene were gasified in 71 minutes. The gas, as it issued from the tube, had a light brown colour. The test was brought to a conclusion through deposition of carbon in the tube. There were formed 9·533 litres of gas, which had (when moist) a specific gravity of 0·56. The following was its percentage composition after elimination of air by calculation: Olefines, 10·50; methane, 56·35; hydrogen, 28·53; carbonic oxide, 0·10; carbonic acid, 0·95; and nitrogen, 3·60. Combustion over mercury gave values which satisfied the equation for paraffins. The hydrocarbons consumed 2·04 and 2·07 oxygen; and their carbon density was 1·027 and 1·04, according to two tests. Traces only of higher hydrocarbons than methane could, therefore, have been present in the residual gas. The acetylene formed amounted to 0·0398 gramme, or 34·27 c.c. The mean molecular weight of the olefines came out at 25·0 (?).

Aromatic products were formed in considerable amount. On disconnecting the tube, it was found to be choked by porous carbon and a thick dark brown tar; and a strong odour of naphthalene was evident. The tar collectors contained an almost black tar similar to that from hexane; and it was worked up in the same way. The percentages of the products from the trimethylethylene were as follows:—

Methane	27·72
Ethylene	8·10
Hydrogen	1·76
Gaseous minor products	4·46
Acetylene	0·30
Carbon	5·09
Benzene	8·00 to 13·41
Tar and absorption in the paraffin oil	39·12 to 33·71

The yield of benzene is thus, as in the case of hexane, considerably greater than at lower temperatures. Also more hexane is formed than corresponds to one molecule for every molecule of trimethylethylene. The reaction does not, in either case, halt at the first stage.

The last experiment on the dissociation of trimethylethylene was made with the middle part of the tube at 1050° to 1060° C. during the flow of the vapour. The gas issued from the tube as a thick black cloud; but the tube rapidly choked up, and brought the experiment to an early close. Only 6·5 c.c. = 4·35 grammes were gasified. There were obtained 1·902 grammes of carbon, some flakes of naphthalene, and a viscid sooty tar, besides gas of the following percentage composition: Hydrogen, 50·0; methane, 30·0; and olefines (ethylene), 5·0.

Some final experiments were made on benzene and acetylene. With regard to benzene, it was established: (1) That it remains essentially unaltered at temperatures up to 900° C., and therefore at the two lower points at which hexane and trimethylethylene had been examined. (2) That between 900° and 1000° C., it splits up; and above 1000° C., the benzene remaining among the products is much diminished. (3) That the higher aromatic products resulting from the decomposition of benzene between 900° and 1000° C. differ from those which occur along with benzene in the tar from the fatty bodies. The products occurring in the latter tar must not, therefore, be regarded as decomposition products of benzene, but as condensation products of benzene with other bodies—especially acetylene.

Lewes examined the decomposition of benzene when diluted with hydrogen, and achieved the following results: There was 5·28 per cent. of benzene in the mixed gas before heating; and after heating to the temperatures indicated, the percentages of the productswere as shown below:—

	900° C.	1100° C.	1300° C.
Unsaturated hydrocarbons	5·03	3·33	2·43
Acetylene therein	—	trace	0·083
Saturated hydrocarbons	—	2·87	5·02
Hydrogen	95·00	93·80	92·47
Carbon (grammes per 100 c.c. of gas)	—	trace	0·01
Tar " " "	trace	0·012	—

Benzene, purified by repeated fractionation, but not free from thiophene, distilled over in the electric furnace at 650° C. quite unaltered, though a faint smell of diphenyl could be detected. On repeating the experiment with the temperature in the furnace rising, it was found that gas began to form at 910° C. The furnace-tube was raised to 1000° C. at its hottest part; and then brownish vapours issued, and the acetylene-silver compound, along with silver sulphide, was deposited in the silver solution. The furnace-tube became choked in a short time; and it was found that 25·5 c.c. of benzene had then been passed through it at the rate of 1 c.c. per minute. The whole of the benzene passed through before the temperature reached 910° C., and a part of that passed through at higher temperatures was found in the condensers, along with diphenyl and crystalline bodies which were not further examined. Naphthalene was not observed, as in the decomposition of hexane and trimethylethylene. There was 0·431 gramme of carbon in the tube. The gas was diluted by the air which filled the tubes at the commencement of the test. The percentage composition of the mixture collected was: Air, 70·3; hydrogen, 22·1; methane, 3·5; olefines, 1·2; and carbonic acid, 0·8.

(To be continued.)

THE CHARACTER OF THE LONDON WATER SUPPLY.

As already mentioned in the "JOURNAL," a paper on the above subject was read before the London Section of the Society of Chemical Industry, on Monday, Jan. 18, by Mr. W. J. DIBDIN, F.I.C., F.C.S., the Chemist to the London County Council. At the close of the paper, a discussion thereon was opened, and adjourned until the 15th ult., when it was concluded. The following is an abstract of the paper (the full text of which is given in the January number of the Society's "Journal"), with some notes of the remarks made thereon.

The author began by stating that, in the course of a series of analyses he had been called upon to make, certain new features had come to light which tended to throw into prominence a point of interest hitherto to a great extent overlooked—viz., that the various matters held in suspension, in presumably pure waters, though small in quantity, are yet often of such a kind as to throw considerable light upon the quality of a sample of water, even after the old methods of analysis fail to distinguish the difference between one sample and another. In the course of his investigations, he had the opportunity of making daily analyses of the water of the River Thames at the Water Companies' intakes, and of the filtered water sent out by the Companies drawing therefrom; also the water supplied by the Kent Company, and by the two Companies obtaining their supplies from the River Lea and the New River. At first these suspended matters were examined only qualitatively; but it soon became apparent that the quantity was sufficient, if properly collected, to admit of exact determinations, and thus more particularly to identify them with the unfiltered river water. A specially-constructed micro-filter was used which enabled determinations to be made of the relative amount, in terms of volume instead of weight, of suspended matter in quantities of water too small for an ordinary analysis. Prior to the author's inquiry, it does not appear that any such quantitative methods had ever been employed. He said it was clear that either vegetable or animal substances might be qualitatively indicated in terms of carbon, nitrogen, ammonia, and so forth; but such methods of expression, though valuable under certain circumstances, conveyed little idea of their relative character, or whether they were in a fresh and wholesome condition or in a state of putrefaction.

Mr. Dibdin quoted from his evidence before the last Royal Commission to show the necessity for a more systematic examination of the London Water Supply. He pointed out that, in the case of the Gas Companies, the gas is examined nightly at no less than 23 testing-stations; and they are subject to forfeiture in the event of the gas being below the standard. In the case of the Water Companies, however, one sample is taken per month; and it did not seem to matter, he said, whether it was good, bad, or indifferent, for no notice was taken. If it was necessary to have such stringent precautions in what concerned the pocket alone—*i.e.*, in the matter of the gas supply—surely one would suppose that equally good supervision should exist with respect to the water supply. In the course of their report, the Commissioners, referring to the treatment of the water after its abstraction from the river, stated that they could not shut their eyes to the fact that the provisions for subsidence and filtration differed enormously with the several Water Companies, and in some cases were, in their opinion, quite inadequate. The author remarked that, unfortunately, there was no information then available as to the exact quantity of matter held in suspension in the water; but the work which had since been undertaken had enabled this point to be most satisfactorily settled, and reliable data were now in existence. While there could be little doubt as to the correctness of the position authoritatively laid down in 1893, the improvement which had been since effected by the Companies had been most marked, and justified opinion that they could and should do better work in purifying the water from contamination. So far this was good. But what guarantee was there that the condition of things above indicated would not return, unless there was kept up a thorough daily examination of the water?

The average results of daily analyses made during nearly twelve months ending December, 1895, gave the quantities of suspended matter in terms of grains per gallon set forth in the table on the next page.

——	Mineral Matter.	Volatile and Organic Matter.	Total.
Chalk.			
Kent	0·0007	0·0004	0·0011
Thames.			
Southwark	0·0031	0·0025	0·0056
Lambeth	0·0018	0·0015	0·0033
Chelsea	0·0014 — 0·0016	0·0013 — 0·0014	0·0027 — 0·0030
Grand Junction	0·0010	0·0013	0·0023
West Middlesex	0·0005	0·0003	0·0010
New River.			
New River	0·0006	0·0005	0·0011
Lea.			
East London	0·0015	0·0012	0·0027
Thames Intakes.			
Sunbury	0·4181	0·1179	0·5360

The author pointed out that the average quantity of suspended matters present in the Kent, West Middlesex, and New River supplies were practically identical—viz., 0·0011, 0·0010, and 0·0011 grain per gallon respectively; so that the West Middlesex Company found it possible, he said, to so purify and store their water that in this respect it bore comparison with waters which were generally accepted, in view of their source, as beyond suspicion. This quantity might therefore be looked upon as that unavoidably due to rust and dust, and formed a standard whereby to judge the quality of the remaining supplies. Taking the average quantity of suspended matter found during the inquiry in the water supplied by the Southwark, Lambeth, Chelsea, Grand Junction, and East London Companies as 0·0033 grain per gallon, and deducting therefrom the 0·0011 grain of unavoidable matters, there was 0·0022 chemically dry grain per gallon as obviously avoidable suspended matters present in the filtered water supplied to consumers. In order that this average factor might be more readily grasped, it could be converted into terms of "mud" of 90 per cent. moisture (the usual percentage present in such matter) actually supplied per annum. Thus the volume of river water supplied by those Companies is 131·6 million gallons daily; so that the quantity of avoidable suspended matters present in the supply is equal to 67·5 tons of wet mud per annum. This, however, includes the period during which the suspended matters were at their lowest. If, on the contrary, the estimation was made on the basis of those present in the Southwark Company's supply during the month of April, 1895—viz., 0·0385 grain per gallon—the annual average would be equal to 1145 tons. The author remarked that it was difficult to judge how far this factor would have been increased had any such estimation of the suspended matters been made during the bad season of November and December, 1891. But from the improvement which had been effected in the colour of the water, as well as in its analytical character, it might be assumed that these matters largely exceeded those present during 1895; and thus enormous quantities of river *débris* must have been distributed throughout the Metropolis during every flood period.

The following table shows the relative quantity of suspended matters present in the supplies of the various Water Companies when determined gravimetrically and by the micro-filter; the figures being the averages for the six months ending November, 1895:—

Company.	Mm. in Micro-Filter per Litre of Water.	Grain per Gallon.	Grain per 1 Mm. of Matter.
Kent	0·30	0·0007	0·0023
New River	0·30	0·0010	0·0033
West Middlesex	0·20	0·0009	0·0022
Chelsea	0·40	0·0021	0·0052
East London	0·60	0·0025	0·0042
Grand Junction	0·40	0·0023	0·0057
Lambeth	0·40	0·0021	0·0052
Southwark and Vauxhall	0·70	0·0039	0·0056
Average	0·44	0·0019	0·0042

The average in the water taken from the River Thames at Sunbury, for the four months ending December, 1895, was 12 mm. = 0·7569 grain, or 1 mm. = 0·0633 grain. The author remarked that these figures show that there is clearly an indication of the quality of the suspended matter from the ratio of millimetres of deposit in the micro-filter per litre of water to grains of actual suspended matter per gallon. When the water is purest, the weight of suspended matter is least—a fact which becomes evident upon microscopical examination. Further examination of the figures reveals another instructive fact—viz., that the quantity of deposit in the micro-filter becomes referable to the actual weight found by a gravimetric process of estimation. Thus, the average depth of deposit in the micro-filter was 0·44 mm. per litre of water, and the average weight of suspended matter found by the gravimetric measurements was 0·0019 grain per gallon; therefore 1 mm. of deposit in the filter is equal to 0·0042 grain per gallon. He thought no serious notice need be taken of any less quantity than this, or even of a larger quantity, unless there was definite microscopical evidence of objectionable contamination, and chemical analysis showed a questionable state of things.

Mr. Dibdin then proceeded to give the results of the chemical examination of the suspended matters, which he said were very remarkable. They pointed to the conclusion that the matters present in three of the Water Companies' filtered supplies approximated more or less nearly in character to those in the unfiltered river waters at the intakes; and this conclusion was, he said, borne out by the results of the daily microscopical examination of all the samples collected. Of the total number examined, the percentages returned as objectionable—*i.e.*, samples which contained a comparatively large quantity of *débris*, &c.—were as follows: Kent, 18; Southwark and Vauxhall, 47; Lambeth, 34; Chelsea, 22; Grand Junction, 25; West Middlesex, 24 (average of the last five Companies, 30); New River, 21; East London, 30. These percentages were calculated into total quantities of objectionable matter present, on the actual estimation of the weights of suspended matters found, and the results are given in col. 2 of the following table:—

——	1.	2.	3.	4.	5.
Kent	0·0011	198	220	90	0·018
New River	0·0011	231	390	130	0·041
West Middlesex	0·0010	240	341	130	0·072
Chelsea	0·0027	594	1,268	139	0·064
Grand Junction	0·0023	575	1,146	170	0·069
East London	0·0023	810	878	277	0·060
Lambeth	0·0033	1,122	1,488	294	0·071
Southwark	0·0056	2,632	2,293	352	0·078
Intake at Sunbury	0·5360	434,160	132,049	16,061	0·128

Col. 1.—Average quantity of suspended matters, grains per gallon. Col. 2.—Objectionable matters in sample, in grains per million gallons. Col. 3.—Organic nitrogen in suspended matters (equal to organic matter containing 4·1 per cent. of nitrogen, as in the Thames at Sunbury), in grains per million gallons. Col. 4.—Average number of microbes per cubic centimetre. Col. 5.—Average oxygen absorbed by the dissolved matters from permanganate in four hours, in grains per gallon.

There was practically complete coincidence between the various methods of examination—*i.e.*, the physical, as the estimation of the weight of suspended matters might be called; the chemical and microscopical examination of their character; the biological examination as to the actual number of bacteria in a given sample of water; and the strictly chemical examination as to the quantity of oxidizable organic matters dissolved. The unfiltered river water contained a mass of matters of generally indefinite character comprised in the term *débris*. But, in addition to these, certain noticeable features were distinct, among which the *diatomaceæ* were predominant. Entozoic worms, various dyed and undyed textile fibres (such as wool, cotton, silk, &c.) were not infrequent; together with numerous infusoria and bacteria. The results of the examination of the filtered supplies indicated the frequent presence of all these substances; and in the majority of cases it would have been difficult for a careful observer to conclude, from the examination of the preparation under the microscope, whether it was drawn from the unfiltered river water or from one of the filtered supplies—it being understood that the actual quantity of *débris* taken for examination was equal in each case. The most noticeable and objectionable feature was the frequent presence of fragments of matter in a state of decomposition, and swarming with bacteria. The presence of such particles could not, the author urged, be accepted as inevitable in the case of a pure water supply, as, if the filter-beds were properly worked, it should be impossible for such matters to pass them; while if their presence were due to dust getting into the pure water reservoirs, evidently greater care should be taken to keep them clean.

The author thought the results he had laid before the Society showed clearly that much more might be learnt from the proper collection and examination of the suspended matters, however small, in a sample of water, than had hitherto been supposed; and he suggested that in future all samples of water should be so examined. A great point had, he said, been made in recent years of the number of bacteria present in a water; but, from the experience he had now obtained, it would seem as if the number of bacteria depended more upon the quantity of suspended matter than upon any other factor. Considerable differences had been obtained in the estimation of the number of bacteria by various observers; and it would seem possible that these were occasionally due to the fact that in one sample of water certain particles of decaying matter might have been present, though absent in another—a result which would account for many hundreds, if not thousands, of colonies being obtained by one experiment, and but few by another, quite apart from the known differences due to varying methods of procedure, temperature, &c.

Mr. Dibdin then passed on to deal with the bacteriological examination of water, which, he said, afforded further evidence of the improvement effected in the various filtered supplies. The following are the average results obtained in 1891-92 of the examination of the water delivered by the several Companies and that taken at Sunbury—the figures given representing the number of microbes per cubic centimetre: Kent, 4795; Southwark and Vauxhall, 4594; Lambeth, 4626; Chelsea, 3091; Grand Junction, 2612; West Middlesex, 2534; New River, 2299; East London, 3387; Sunbury, 179,601. In 1895, the numbers were as follows: Kent, 90; Southwark and Vauxhall, 352; Lambeth, 294; Chelsea, 139; Grand Junction, 170; West Middlesex, 130; New River, 130; East London, 277; Sunbury,

16,061. Having thus reliable data for comparison as to the bacteriological improvement which took place in the quality of the water between 1892 and 1895, the author directed attention to the still further improvement effected during the course of the latter year, and to the relation existing between the quality of the intake waters and the filtered supply. He remarked that the Company who supplied water containing the largest quantity of suspended matters—viz., the Southwark and Vauxhall—sent out an average of 352 microbes per cubic centimetre of water throughout the year; this being the largest number of any of the Companies. In January, the monthly average was 838; and it gradually decreased to 78 in October. But, unfortunately, it rose again to 427 in November, corresponding to the rise of microbes in the Sunbury water of from 9900 in October to 45,263 per cubic centimetre in the following month.

A comparison was next made of the present water supply of London with the proposed supply from Wales; the samples of Welsh waters being taken by Mr. Dibdin in May, 1894. He gave figures which showed that the filtered river water supplied during the six summer months to London contains practically identically the same amount of organic carbon and nitrogen as that present in the unfiltered Welsh waters—viz., 0·128 part per 100,000, against 0·123 part, while during the six winter months it is only half as much again, 0·199 part. The oxygen absorbed from permanganate is a little more—viz., 0·057 grain instead of 0·048 grain per gallon during the summer, but only a little more than half as much again (0·079 grain) during the winter. In like manner the albuminoid ammonia in the Welsh water averages 0·0033, against 0·0045 and 0·0055 in the respective summer and winter London supplies, excluding the Kent. The colour of the water when viewed through a 2-feet tube was, on an average, even greater in the case of the Welsh water—viz., 1·4, against 1 and 1·2 in the case of the London supplies. From a comparison of the average results of nearly 3000 analyses, Mr. Dibdin thought it was evident that the organic impurity of the unfiltered Welsh water is a little less than that in the average filtered London water; and the inquiry naturally follows as to the specific differences which exist. This is undoubtedly due to two things—first, the quantity of solid matter in solution (principally salts of lime), giving the London water its great hardening properties; and, secondly, the comparatively large number of floating particles, on which the number of microbes present to a great extent depends. The unfiltered Welsh water examined on the spot contained 26 microbes per cubic centimetre; while the average London filtered waters had in summer 167 and in winter 298—the Kent supply having 90. These numbers, he pointed out, referred solely to the quantity, and not to the character, of the microbes.

The concluding portion of the paper was devoted to a consideration of the effect of softening the water now supplied to the Metropolis. The suggestion has been repeatedly made that the lime in the water should be removed by the adoption of Clark's process; and Mr. Dibdin thought it was only natural to inquire as to what would be its effect on the present filtered river water, not only in removing the excess of carbonate of lime, and thus enormously improving the commercial value of the water, but also in assisting in the process of purification. With the view of testing this question, certain experiments were made on one of the best waters—that of the New River Company—in order that the percentage reduction, if any, which might be brought about in the quantity of dissolved as well as undissolved impurity might be ascertained. The results, which he presented in tabulated form, showed that, even in the case of the New River water, the reduction of dissolved organic impurity was equal to 25 per cent., as indicated by the oxygen absorbed; while 64 per cent. of the total hardness was removed, as well as 87 per cent. of the bacteria, and with these the whole of the matters in suspension. If one of the less pure waters had been taken for the experiment, Mr. Dibdin said the percentage reduction of impurities would doubtless have been larger. Applying these results to the average analytical figures relating to the London and Welsh supplies already alluded to, it was found that the albuminoid ammonia in the summer supply would fall, by the adoption of the softening process, from 0·0045 to 0·0034, or identically the same quantity as that contained in the unfiltered Welsh supply; while the winter supply would be improved to the quality of the present summer supply. The oxygen absorbed in four hours would fall from 0·057 to 0·043 grain in the summer, and from 0·079 to 0·059 grain in winter, against 0·048 grain in the Welsh water, or a yearly average of only 0·003 grain per gallon in excess. With regard to the organic carbon and nitrogen, it would be less in proportion; while practically the whole of the suspended matters would be removed, and with them 87 per cent. of the bacteria—thus reducing the summer number of microbes, apart from their character, from 167 to 21, and the winter number from 298 to 38, against 26 in the Welsh water, or an annual average difference of + 3. In addition to these enormous improvements, the hardness would be reduced in summer from 12·5° to 4·4°, and in winter from 17° to 6·1°, or an annual average of 5·2°, against 3·1°, which was the average hardness of the Welsh waters as examined in May, 1894. It would therefore seem that, by the adoption of the system of softening, the present supply, in respect of its chemical quality and the number of bacteria, would be improved to a degree comparable with that from the Welsh sources.

In the course of the discussion on the paper,

Mr. W. T. Burgess, an assistant to Dr. Frankland, remarked that the length of main from the reservoir to the stand-pipe, whence samples were taken, would much affect the degree of contamination of the water. He also said that the period 1891-92 chosen by Mr. Dibdin to illustrate the amount of nitrogenous impurity in the water prior to recent agitations for its better purification, was one of the worst known, owing to the water at the intakes of the Companies being then exceptionally impure. The examinations of the water for some years preceding 1891-2 showed it to be equally as good as in subsequent years.

Dr. Dupre pointed out that an epidemic in one of the towns on the upper reaches of the Thames might at any time cause greater contamination of the water at the intakes than the Companies' filtering arrangements could grapple with, and that the result might be disastrous to the public health of London. It was, however, for Londoners merely a question of £ *s. d.* whether the comparatively remote risk to which they thus exposed themselves was sufficiently important to justify the great expenditure which the bringing of an absolutely irreproachable water supply from Wales or elsewhere would involve. The speaker referred in favourable terms to the micro-filter, but said that at first an operator found its use attended with difficulties.

Mr. A. E. Fletcher recommended, on the score of economy in industrial and household use, the softening of water supplies. He quoted the softening works in the Caterham Valley as an illustration of the benefits to be derived from the adoption of the process.

Mr. Bertram Blount congratulated Mr. Dibdin on the admirable and useful addition he had made to a water analyst's means of observation in the shape of the micro-filter. He ventured to suggest that the almost capillary tubes employed in the filter method might with advantage be made to uniform dimensions, if this were possible. So far as he was aware, the tubes used might vary considerably in internal diameter, and the cavity might have a section by no means circular; and that consequently the "millimetre" might have a very different significance for the several parts of each tube and for various tubes. Perhaps Mr. Dibdin could say if standardized tubes could be obtained. He suggested that some of the *débris* which Mr. Dibdin had found in the filtered water supplies might not have been matter that had passed the filter-beds, but might have arisen from detrition of the packing, &c., of the joints of the mains. He then went on to consider the import of the suspended matter which had been observed in the filtered river waters. He particularly desired to emphasize the fact that it had a qualitative and not a quantitative value. Dr. Dupré had, he said, already pointed out that the use of the present water supply entailed a certain risk of epidemic to Londoners; but the speaker was of opinion that it was comparatively remote, and certainly not comparable in intensity with risks people daily faced without alarm. This being the case, the proposition to bring from afar a water supply that might prove somewhat superior to the existing one, seemed to him uncalled for. His own knowledge of the Welsh rivers taught him that at times their water was very different in character from the samples taken in May by Mr. Dibdin; and he submitted that it was unfair to the London water to give the results of analyses of it throughout the summer and winter periods, and those of Welsh water during one month only. He considered a softened water was very objectionable to the palate, and unpleasant for ablutionary purposes.

Mr. E. G. Hooper asked what was Mr. Dibdin's view as to the actual condition of the London Water Supply at the present time, and whether there was any immediate risk attending it. Did Mr. Dibdin recommend softening the water? He (Mr. Hooper) deprecated the introduction in the paper of impressive totals for the sake of giving a heightened effect to their true significance; and he thought the expression of the suspended matters present in the supply as 67·5 tons of "wet mud" was misleading. If it was assumed that each individual drank, on an average, one pint daily of water as drawn from the mains, he would in reality only be taking into his system thereby 0·003 grain of solid matter per diem. Mr. Dibdin found no fewer than 30 per cent. of the samples of London water "objectionable;" but he even considered 18 per cent. of the samples of Kent water, which was the standard of comparison accepted by him, as objectionable also. A Commission appointed many years ago to inquire into the cost of softening London water, fixed it at £1 7s. per million gallons, or about 4 per cent. on the selling price of the water.

Mr. W. Thorp asked what quantities of water had been taken by Mr. Dibdin in his tests of the weight of suspended matters present, as the weight of matter found in 100 gallons of water appeared scarcely susceptible of gravimetric estimation. In his opinion, it was wrong to accept the 0·0011 grain per gallon of suspended matter in the Kent water as a constant to be deducted in every case, as it seemed to be by no means constant in the Kent water itself. He thought the attempt to present the results of water analyses in a form in which those who were not chemists or experts might be tempted to pass judgment upon samples, was likely to lead to disastrous consequences. Only the chemist was able to interpret the results of chemical analyses, and to appreciate the relative importance of the different items.

Mr. E. J. Bevan remarked that Mr. Dibdin had found waters from exceptional sources faulty. He had said that there was a practically complete coincidence between the three methods of examining water—viz., the physical (as he termed the estimation of the weight of suspended matters), the chemical, and the microscopical examinations. But Mr. Dibdin's figures did not always reveal such a coincidence. For example, the average amounts of suspended matter found in the New River and West Middlesex waters were nearly identical; but the average oxygen absorbed was in the former 0·041 and in the latter 0·072 grain per gallon. Again, the suspended matter in the cases of the Grand Junction, East London, and Chelsea waters was nearly identical in amount (0·0023, 0·0023, 0·0027 grain per gallon respectively); but the number of microbes found per cubic centimetre varied greatly—being 170, 277, and 139 in the three cases.

Mr. Whitaker suggested that the bulk of the London water must primarily have been derived from the chalk. Thence it appeared that the contamination of the river water was acquired on its way down; and the rivers should therefore be very closely watched. As a rule, such contamination as it acquired was harmless; but it might become otherwise at any moment. He was interested in the softening of water on a large scale; and he pointed out that probably the largest softening works in the country were at Southampton. He had it from the Engineer of those works that the cost of softening was about ¼d. per 1000 gallons.

Dr. Bernard Dyer expressed admiration of the micro-filter, but pointed out that it was useful rather to show the nature of the suspended matters than as a means of quantitative examination. He regretted that Mr. Dibdin had not been able to examine the water at the filter-beds, instead of that drawn from the mains. The organisms found in samples taken from the mains might not be pathogenic ones which had eluded the filters, but might result from the multiplication of a few harmless or even beneficent organisms in the water as it left the works. Perhaps they were of later origin, as those who were in the habit of noticing deposits in cisterns, &c., might well believe.

Mr. C. E. Groves, F.R.S., asked how the samples for examination had been collected, especially such as were used for the bacteriological investigations. He considered the amounts of solid matter detected were of little importance in regard to the potability of the waters, as in many cases more dust would be found adhering to the glass into which it was drawn than there was solid matter in the water itself. Water-mains were by no means too clean; and for making a fair comparison between London and Welsh water, the former should have been sampled as it left the filter-beds.

Dr. S. Rideal thought Mr. Dibdin had not given the meeting a clear notion of the sense in which he used the word "suitable" in regard to waters. He pointed out that, in the slight typhoid outbreak in London in 1895, no sporadic cases were found in the Kent Company's district; and there was no doubt the outbreak was due to the defective state of the Thames water supplies. He considered the determinations of the organic matter in the water most valuable. There appeared to be no very close relation between the length of suspended matter observed in the micro-filter tubes and the amount of the deposit, as the length varied with the nature of the latter. He thought the average oxygen absorption the best criterion of the organic purity of a water.

After some further observations,

The Chairman (Dr. R. Messel) asked Mr. Dibdin to reply to the remarks made on his paper. The hour being late, the reply was somewhat curtailed.

Mr. Dibdin first dealt with the remarks of Mr. Burgess. He said he had been unable to trace any relation between the length of main traversed by the water and the amount of suspended matter found in it. It was notable that the quantity of suspended matter in the water decreased rapidly and very considerably shortly after it became known that the observations recorded in the paper had been commenced; and that since that time there had been no recurrence of the former large quantities of suspended matter. He judged, therefore, that the Water Companies were able to give an unexceptionable supply under ordinary conditions; but he thought it desirable that they should be kept to their work by frequent periodical examinations of the water. Personally, he was of opinion that the softening of a water supply such as that which London had, would be both economical and comfortable; but he had not put forward his own feeling in the matter. If questioned on the point, he was free to confess that if the present London supply was softened before distribution, it would be every whit as reliable and good as a supply brought from Wales. He knew that this view did not meet the approval of many persons who had set their minds on a scheme for bringing Welsh water to the Metropolis. But the water now supplied, if softened, would be quite as good as any other that might be obtained. He thought, however, that the public were not sufficiently protected in respect of regular and careful examination of the water; and whether the supply remained in the hands of the Companies or was given over to someone else, he would strongly advocate rigorous inspection of the water by examiners appointed by an independent body. He noticed that Dr. Frankland at one time reported the presence in London water of "occasional moving organisms," and later the presence of "bacteria;" but there was no allusion in his reports to the amount of suspended matter. In the worst condition of the water, however, the suspended matter was highly dangerous. The reports gave results of other estimations even to 1-10,000th of a grain per gallon; but the comparatively immense quantity of 1-20th or 1-30th of a grain of suspended matter was wholly neglected. In 1892, he had every reason to believe that there was frequently 1-10th of a grain of suspended matter per gallon of water in the supplies derived from the Thames. The gravimetric estimations of suspended matter were made by running about 200 gallons of water per day, at a uniform and slow rate, through a filter for a period of ten days. The analyses were thus on quantities of about 2000 gallons of water, which were quite sufficient for accurate determinations. The point he wished to make clear in presenting the results as "tons of mud" was that the dirt in the aggregate amounted to a large quantity, and it might have contained a considerable number of organisms. He had noticed that many otherwise intelligent people did not gain any impression from decimals or amounts such as 1-1000th of a grain or of an inch. He therefore had resorted to the expression of his results in the form which conveyed an impression to such otherwise intelligent people—viz., in tons of mud. He was not a bacteriologist, and he had nowhere pretended to discriminate between pathogenic and non-pathogenic organisms. He had merely stated the number of microbes per cubic centimetre found in the waters analyzed. Owing to the nature of the micro-filter test, it was quite superfluous to use standardized tubes. He could satisfy Mr. Hooper that the present state of the London Water Supply was, in his opinion, by no means such as to demand serious attention; but he wished to point out that there was no safeguard against a relapse to the state of things which prevailed prior to 1893. The quantity of suspended matter found in the Kent water varied; and it was observed that it was not always of the "rust and dust" character, since *anguillulæ* were sometimes present, which he could only suppose found admission at the works. If this were the case, there was evidently something not wholly satisfactory in the treatment of the water. He thought, notwithstanding Mr. Bevan's strictures, that there was, on the whole, a fairly uniform ratio between the results of the micro-filter and bacteriological examinations. He regretted that he had no power to take samples of the water at the Companies' filter-beds. Nevertheless, to obtain average representative results in such a manner would have entailed a quite incommensurable amount of labour, owing to the number of filter-beds, one only of which might at any time have been failing to do its work properly. Furthermore, he thought it was right to take the water as it was delivered to the consumers. The samples used for the bacteriological examinations were collected in carefully-cleansed bottles which had been sterilized at 400°.

A hearty vote of thanks was accorded to Mr. Dibdin; and the meeting closed.

Lamplighters' Wages at Sunderland.—In response to an application by the lamplighters at Sunderland for an advance of 3s. per week, the Directors of the Gas Company offered an increase of 1s. This, however, the men rejected; but as a result of a conference since held between the men's representatives and the employers, the latter made a further offer of 6d.—1s. 6d. in all—bringing the wages up to 19s. 6d. This the men have agreed to accept.

Reductions in Price.—The Brynmawr and Blaina Gas Company have reduced their price by 6d. per 1000 cubic feet as from the beginning of the year. The Londonderry Gas Company have reduced the price of gas to 3s. 6d. per 1000 cubic feet to private consumers, and by 1s. 6d. for each public lamp. The Leighton Buzzard Gas Company are about to reduce their charge 2d. per 1000 cubic feet. The price of gas at Farringdon has been reduced from 5s. 10d. to 5s. per 1000 cubic feet. The Directors of the Tonbridge Gas Company have announced their intention of reducing the price of gas from 3s. 2d. to 3s. per 1000 cubic feet from the 31st inst. The Directors of the Windsor Gas Company have reduced their price from 3s. 6d. to 3s. 4d. per 1000 cubic feet, to take effect from the commencement of the current quarter. The Dudley Gas Company have reduced their charges in Netherton from 3s. 3d. to 3s. per 1000 cubic feet for private consumption, and from £2 15s. to £2 12s. 6d. per annum for street-lamps.

Manchester Corporation Water-Works Extensions.—A public meeting of owners and ratepayers of Manchester was held last Thursday, for the purpose of approval or otherwise of the promotion by the Corporation of their Bill in the present session of Parliament. One of the principal purposes of the Bill is to obtain authority to construct a new water-main between the Godley and Audenshaw reservoirs. The Chairman (Alderman A. E. Lloyd) formally moved the necessary resolution; and it was seconded by Alderman Sir B. T. Leech, who explained that the new main was required in order to make the works at Longdendale more fully available. The main at present in use had seen long service; and another one was needed, particularly for the water supply in the higher districts of Manchester. The new main would enable them to carry out certain repairs on the old one. There had been a great increase within recent years in the demand for water, both for domestic and for trade purposes; and, in addition to the new main, a new straining-well would be required, in order that they might be able to cope with the demand. It might be asked, Why not bring more water from Thirlmere? The reason was this, that it would cost half a million of money to lay a new pipe from Thirlmere; and by the proposed new main, they would get, at a much lower figure, a supply that would last for many years. Power was also desired to extend the hydraulic works. These were started three or four years ago, and had worked exceedingly well. Replying to a question, he stated that the revenue which would accrue would amply repay the money it was proposed to expend. The motion was carried unanimously.

REGISTER OF PATENTS.

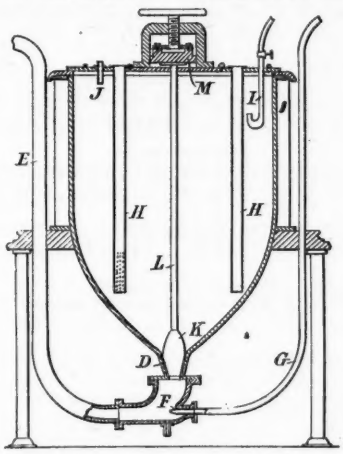
Prepayment Meters.—Bastian, C. O., of Manchester Square, and Hodges, H. C., of Hampstead Road. No. 2224; Jan. 30, 1896.

This invention relates primarily to prepayment electricity-meters, though applicable to prepayment gas-meters. There is put in combination with the meter mechanism an arrangement of coin-freed mechanism adapted, on the insertion of a coin, to separate the parts of a contact-making device a given distance from one another in a local electrical circuit, and simultaneously open the supply through the meter; an axis or other suitable means (operating by the meter mechanism, and in connection with one part of the contact-making device) being thereby moved into contact with the other part, on the completion of the supply of the predetermined amount of electricity, whereby the local circuit is closed, and any further supply through the meter cut off.

In applying the invention to gas-meters, instead of the main contact piece making and breaking an electrical current, a suitable lever or arm would be so arranged that, on the reciprocation of the operating rod, the latter would cause the lever or arm to open a valve or other suitable device controlling the gas-main, and the valve lever or arm would be caught and automatically held by a clutch with the valve or other device for controlling the gas or other supply "open," and there held against the tendency of a spring or its equivalent. When the supply of gas has been delivered, and has moved the conductor arm into contact again with the electrical contacts on the radial arm on the ratchet-wheel, the circuit is completed round the electro-magnets; and the latter, being thus magnetized, draws the clutch clear of the valve lever or device, which thereupon automatically closes the valve and cuts off the supply of gas, while at the same time a contact make-and-break device is so arranged and combined with the valve-lever that, on the release of the latter by the clutch, it will break the battery circuit to the electro-magnet, and thus not only release the clutch in readiness for it to act again to hold the valve-lever open on the next reciprocation of the operating rod, but also thereby prevent the running down of the battery.

Sulphate of Ammonia Saturators.—Duggan, P., of Rosherville, Gravesend. No. 5011; March 5, 1896.

The saturator shown in the engraving is made circular in plan, and supported by columns or otherwise as convenient. It is preferably provided with a cover made in parts hinged together, so that it can be opened to admit workmen into the interior when necessary. The bottom of the saturator is of conical or curved shape, so that the sulphate as formed falls towards an outlet D, which communicates with a discharge-pipe E, into the lower end of which protrudes the nozzle F of an injector-pipe G supplied with steam, compressed air, or other suitable means for discharging the sulphate through the pipe E into a



strainer or other receptacle. By placing the injector wholly outside the saturator, condensation of steam in the pipe G is largely avoided (as the pipe can be covered with insulating material); and the efficiency of the injector as a discharging means is thereby materially increased. The patentee claims that he is enabled to raise the salt 15 feet above the level of the acid in the saturator, and consequently to deliver it on to the drainer at such an elevation that it may be discharged from the latter into the store without the intervention of trucks.

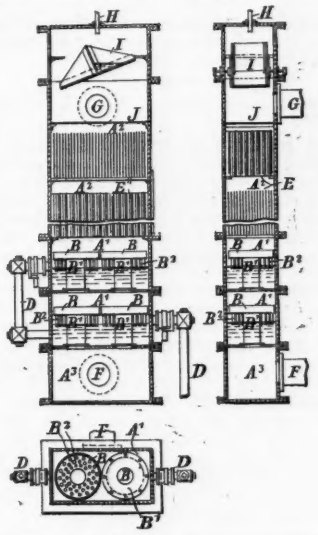
H are the pipes through which the ammonia is introduced into the saturator; I, the pipe through which the acid is introduced; and J, an outlet for gas or vapour generated in the saturator.

If desired, the injector may be dispensed with, and the sulphate discharged by gravity alone—a valve being employed to regulate its exit. A suitable arrangement for this purpose is shown. K represents a plug or valve fitted liquid-tight into the outlet-opening D, and connected to a stem which passes up through the cover, and is provided at its upper end with a crosshead guided by a bridge-piece fixed on the stationary part of the cover. The upper end is provided with a hand-wheel for turning the screw, and raising (without turning) the plug K.

Washing, Scrubbing, and Purifying Gas.—Hersey, S., and Kirkham, Hulett, and Chandler, Limited, of Palace Chambers, Westminster. No. 5686; March 13, 1896.

This apparatus for washing, scrubbing, and purifying gas, consists of a gas and water tight vessel, divided into a number of superposed compartments, some of which contain roses, and some sets of vertical plates preferably corrugated (kept equidistant from one another by washers or indentations), placed one set at right angles to the set in the next compartment. At the top of the apparatus is a tumbler or tilting vessel, supplied with liquid from above, so that, as the balance is disturbed, the water is thrown down on to a perforated plate, preferably sloped towards the centre of the vessel.

The washer is divided, as shown, into two compartments A^1, fitted with roses B, with central inlet-pipes B^1, secured to the partitions separating the compartments; and B^2 are the outlet-pipes, which project downwards from the roses. These outlet-pipes are slotted (or they may be perforated) at their lower ends, which dip into water or other liquid. The outlet-pipes are clustered around the central inlet-pipe, as shown. D are the outlet-pipes, having regulating-valves to vary the levels of the liquid in the compartments A^1, so as to alter the seals or unseal the pipes as may be desired. E are corrugated iron plates in the compartments A^2, and arranged at right angles to those in the adjacent compartment.



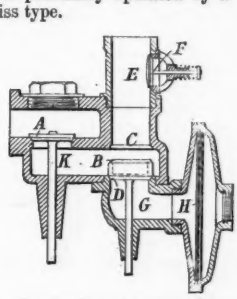
F is the inlet for the gas in the lowest compartment A^3; and G is the outlet at the upper end. H is the inlet for water or other washing liquid at the top of the apparatus. I is a tumbler or tilting vessel, into which the liquid flows through the inlet H—being mounted on pivots so that, when it contains a certain quantity of water, it tilts and throws down the water on to the perforated plate J, which is sloped towards the centre, and through which it escapes down the washer.

The operation of the apparatus is as follows: The gas enters at the bottom compartment A^3 through F, travels upwards through the central inlet-pipes B^1 of the roses B, and down through the slotted outlet-pipes B^2, through the water into the lower compartment A^1; thence through the roses in the upper compartment A^1, from which it passes upwards between the lower series of corrugated plates E, and finally through the upper series of corrugated plates E and the perforated plate J, so as to escape through G. The water admitted at top through H is thrown down by the tumbler I on to, and through, the perforated plate J, which divides it into streams, which then pass down between the corrugated plates E into the chamber A^1, and finally escape through the upper overflow-pipe D into the lower compartment A^1, from which the water passes through the lower overflow-pipe D.

Gas-Motor Engines.—Lanchester, F. W., of Alvechurch. No. 5814; March 16, 1896.

This invention relates to the charging, exhausting, and governing of gas-motor engines; the object being to provide an arrangement so that the exhausting and charging may be controlled from the governor.

Opening directly into, or communicating with, the engine cylinder, is a main valve A of the ordinary lift type, operated at the proper moment from a cam on a side shaft, and returned to its seat by a spring every alternate revolution of the engine. The under portion (or eduction side) of this valve leads to a short chamber K, having two valve-seated openings C D placed concentric with and opposite each other on either side of the chamber K. These openings lead—C into the exhaust-pipe E; and D, to G, the supply of explosive mixture. A double-seated lift valve B, placed between C and D, is of such a depth that, when it closes the opening leading to the inlet-pipe, that leading to the exhaust-pipe is left clear, and *vice versâ*—a suitable lift brings it against and closes the exhaust opening, while leaving the passage free to the inlet. This double-seated valve is preferably operated by a governor of the usual gas-engine hit-and-miss type.



When in operation, the engine piston makes a forward or suction stroke; and during this time the main valve A is held open, while the double-seated valve B is lifted so that the passage to the exhaust-pipe is closed while that to the inlet-pipe is open—a charge of vapour and air being thus drawn into the cylinder by way of G and K. On the completion of the suction stroke, the main valve closes, and the valve B shuts on to the admission opening. The piston now makes its return stroke, and compresses the mixture, firing it when compression is complete, and then making a forward or working stroke as usual in "Otto" cycle

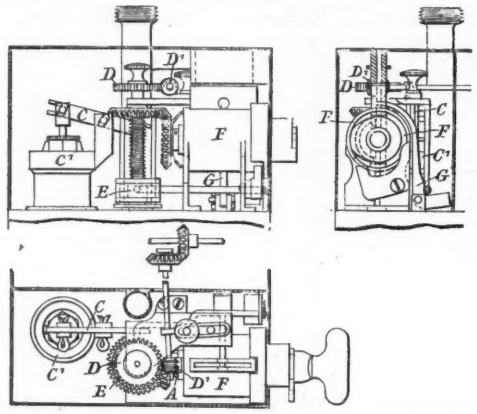
engines. The main valve A now opens; and a return or exhaust stroke is made. When the engine is working at full load, the valve D crosses over to close the exhaust aperture; and the piston draws in a new charge of combustible mixture, to be in turn compressed and ignited. When a pre-arranged speed is exceeded, the governor gear causes the mechanism to miss operating the valve B; and the motor piston then draws back a charge of exhaust gases from the exhaust-pipe E, and a missed impulse results. An automatic valve (as F) may be arranged on the exhaust-pipe, so that a certain amount of ventilation takes place at each cut-out, to prevent condensation of the exhaust products within the motor cylinder.

To avoid back-ignitions into the inlet-pipe, there is sometimes placed in the passage G a series of thick gauze copper screens (as H), through which the mixture of gas and air is drawn.

Prepayment Gas-Meters.—Anderson, J., of Edinburgh. No. 6794; March 28, 1896.

This coin-freed gas-meter mechanism is suitable for converting ordinary meters into prepayment ones; the auxiliary mechanism being fitted in a partitioned chamber at the side of the meter-case.

The proposal consists first in fitting a bevel wheel on the inner end of the horizontal spindle A of a rotary coin-receiving chamber, and gearing it into a corresponding wheel mounted loose on a vertical spindle B. This vertical spindle is formed with a screw-threaded surface; and a screwed nut or disc E is mounted to work up and down on it. Vertical rods (preferably two) are connected between the loose bevel wheel and a crosshead mounted loose on lower end of the screw-spindle B, to actuate the screw nut E, and allow of its up and down travel; and the rods pass through slots at the outer edge parts of the screw-nut. An annular ring or collar is fitted between flanges at the top and lower ends of E, so that the ring travels up and down the spindle B with the nut, but does not revolve with the spindle. The kneed end of a rod is attached to this ring; and the free end of the rod has a pointer mounted on it in front of a vertical index dial-plate, so that, as E moves down or up, the rod travels on the ring with it, and shows how much prepaid gas has still to flow. The kneed part of the index-rod engages with the free end of the lever C of the gas-inlet valve, which is in a partitioned chamber C^1, constructed as described in patent No. 1178 of 1894.

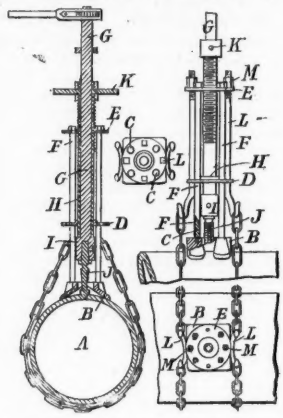


A gapped or recessed part with an angled tail is formed on the end of the lever C; and when the coins are first dropped into the holder F, and the latter turned, the bevel wheel and rod connections turn and lower the screw nut E, and the index-arm draws down the end of the lever C, and so automatically opens the valve for the passage of gas to the consumer. As the screwed nut E travels down by the insertion of further coins and the turning of the bevel gear, the index-rod leaves a greater distance between it and the valve-lever C. A lever G has its upper kneed end projecting through a slot in the case of the coin chamber, so that, when the nut E has descended to its bottom travel, the index-rod acts to tilt the lever G, so that its upper end enters and blocks the slit part of the coin case, and prevents more coins being inserted until further gas has been consumed; while as the nut rises, the lower end of the lever G is freed, and the weight automatically tilts the lever and frees its upper part from the coin-slit.

A star or worm wheel D is attached at the upper end of the screw-threaded spindle B, and is geared to a worm D^1 formed on the end of a horizontal spindle. The other end of the worm spindle has a bevel wheel secured on it, which is geared to another bevel wheel fixed on a cross-spindle of the ordinary power transmitting and counting mechanism of the meter. By this means, as prepaid gas is being consumed, motion is transmitted from the cross-spindle through the bevel gear and worm D^1 and star-wheel D to the vertical screw-spindle B; and the turning of this latter will raise the screw nut E, so that, when all the prepaid gas has been consumed, the kneed part of the index-rod will act on the end of the valve-lever C, and tilt it to close the valve and shut off the supply of gas. The worm-spindle passes through the eye of an adjustable slotted plate, so that it can be drawn to one side, and enable the wheel D to be changed for a larger or smaller wheel according to the price of gas.

Drilling and Tapping Mains.—Deighton, W., of Harrogate. No. 7122; April 1, 1896.

The saddle or principal bearing-piece B of this mechanism is formed for contact with the pipe A; and into it are screwed the bolts C, which extend therefrom so that the tubes F may take over them. These tubes are in two parts—one below the plate D, the other above; so that by the bolts passing through the plates D and E and through the tubes F while these latter abut against the saddle and the plates, by tightening up the nuts at the ends of the bolts, the several parts are securely held together. Mounted concentrically within the plates is the sleeve H; its lower end passing loosely through D, while its upper end is screwed to fit the internally screwed or tapped opening made in E. The positions of the sleeve relatively with the plates is regulated by turning the handle K to make same advance or recede by its screwed part.



The drill-spindle G is made to fit so that it may rotate within the sleeve, and thus forms a firm support for it. At its lower end is provided a boss or hub I, to receive the drill J. The boss is formed to have a shouldered part for the lower end of the sleeve H to press against, by which means the force exerted in causing the sleeve to advance through the plates E and D, acts directly upon, and straight in line with, the spindle G. Thus the greatest possible power is afforded the sleeve H over the spindle G and drill J. Hence its thickness may be small.

To secure the saddle and its several parts in contact with the pipe to be drilled, two rods L (preferably square) are mounted by passing loosely through holes in the plates D E, so that the hooks on the lower extremities may lay hold of chains. Thus, by tightening the nuts M, the rods will securely hold the whole mechanism in position.

Automatic Control of Gas Supply to Stoves.—Wynn, J., of Cardiff. No. 21,050; Sept. 23, 1896.

The inventor proposes to connect with the plug of the tap for regulating the supply of gas to the burner, a spring-controlled arm, which projects above the bars of the stove, and is so arranged that, when a vessel is placed on the stove above the burner, the arm will be shifted in opposition to the spring, and the gas turned on. For obtaining various heating effects—such as boiling, simmering and warming—the vessel is shifted to such a position that the arm can move backward or rise more or less by the action of the spring, whereby the tap will be partially closed. For cutting off the gas supply altogether, the vessel is entirely removed from contact with the arm, which is thus permitted to move backward or rise under the influence of the spring; and the tap is then quite closed by the spring. To facilitate the action, the arm is furnished with a roller at its end.

APPLICATIONS FOR LETTERS PATENT.

4717.—Wright, A. E., "Preventing fracture of water service-pipes by frost." Feb. 22.

4721.—Walker, H., "Manufacture of calcium carbide." Feb. 22.

4734.—Barillot, E., and Leclaire, C. C., "Storage of acetylene gas." Feb. 22.

4759.—Conrad, R., "Gas motors." Feb. 22.

4761.—Lacroix, P. A. M., "Producing acetylene gas." Feb. 22.

4762.—Matchett, R., "Reducing the pressure of liquids and gases." Feb. 22.

4775.—Lake, H. H., "Incandescent gas-burner." A communication from P. Octure and A. Desmazures. Feb. 22.

4781.—Boult, A. J., "Production of acetylene gas." A communication from E. Melin. Feb. 22.

4790.—Smith, F. H., "Acetylene gas lamp." Feb. 23.

4791.—Kemp, C. W., "Improvements in incandescent gas lighting." Feb. 23.

4803.—Bamford, J., "Incandescent burners." Feb. 23.

4870.—Frost, E. J., and Middleditch, B., "Automatically regulating the quality of gas." Feb. 23.

4879.—Prentice, C. M. C., "Gas and other engines." Feb. 23.

4888.—Ollivier, A., "Gas and oil motors." Feb. 23.

4987.—Rousset, G. A. E., and Cobler, A., "Production of acetylene." Feb. 24.

5044.—Missire, F. & F., "Burners for incandescent lighting." Feb. 25.

5048.—Rowbotham, W., "Explosion engines." Feb. 25.

5051.—Holden, A. W., and Brown, F. W., "Acetylene gas generators and ometers." Feb. 25.

5149.—Roedel, A., "Apparatus for removing graphite crusts from the interior of gas-retorts." Feb. 25.

5191.—Davis, C. W., and Turner, H. C., "Gas-stove burners." Feb. 26.

5214.—Boult, A. J., "Igniting devices for gas-burners." A communication from J. Canellopoulos and H. O. Kratz-Boussac. Feb. 26.

5236.—Franco, C. B. y, "Generating and burning acetylene gas.' Feb. 26.

5297.—Emmett, H., "Incandescent gas-burners." Feb. 27.

Ottoman Gas Company, Limited.—In their report for the six months ending Dec. 31, which will be presented by the Directors of the above-named Company at the ordinary general meeting next Tuesday, they state that the gas-rental for the period amounted to £9223, and the net profit to £3797. The balance standing to the credit of the profit and loss account is £4287, which the Directors recommend should be dealt with as follows: Addition to the reserve fund, £1000; dividend at the rate of 7 per cent. per annum on both classes of shares, £2625; balance to go forward, £662.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Carburetted Water Gas.

Sir,—Though but little inclined to controversy, I think the statements of the President of the Manchester District Institution in reference to carburetted water gas call for a few observations. Mr. Porter does not seem to have had any practical experience of the system, nor does he appear desirous to have; and he is even reluctant to admit that it possesses any advantages, either as regards economy or convenience, over the older commodity. I question if any one of the managers who within the past three years have taken up the manufacture of carburetted water gas will be found to support the views and calculations which he has submitted. His figures are carefully selected; but they do not seem to have been intended to give water gas a chance. In his tables, he takes oil as costing 4d. per gallon. We have paid this year as much as 3d. per gallon; but doubtless we could purchase now at 2⅞d. or perhaps 2¾d. Last year we only paid 2d.; and the year before, 2¼d. Possibly in some places the price of oil may be 4d.; but I do not know of an instance. In any case, it is not fair to take as a basis of calculation the highest rate that can be found for the article which chiefly affects the cost of production in one case, and to compare this with results from selected places in the other.

It is not quite clear what Mr. Porter includes in his estimates of the cost of coal gas. In his first table, he seems to have taken only coal, purification, and carbonizing. In a subsequent estimate, he gives details of four works, including the South Metropolitan; the figures referring to the working of this Company being apparently taken, up to a certain point, from Field's "Analysis." When, however, he comes to the item "wear and tear," which in the case of the South Metropolitan Company is put down at 4·51d. per 1000 cubic feet, he discards "Field," and introduces the item "repairs in retort-house, 0·75d.;" and this appears to be an arbitrary figure, inasmuch as exactly the same sum is put down in each of the other cases tabulated. Giving the full statement as in "Field," the actual cost per 1000 cubic feet would be—

Coal, less residuals	3·53d.
Manufacturing charges	8·62
Total	12·15d.

This is the cost per 1000 cubic feet *sold;* and, taking the unaccounted-for gas into consideration, it would represent 11·48d. per 1000 cubic feet into the gasholder. The gas is returned as of 16·40 candles illuminating power. Our cost last year into gasholders for carburetted water gas of about 22-candle power was 12·054d. per 1000 cubic feet. It was, of course, quite open to Mr. Porter to choose only such cases as would make it appear that carburetted water gas is an expensive delusion; but I think it was hardly fair to carry the figures to the point at which the great economical advantage of the carburetted water gas system began to be apparent—viz., cost of maintenance and repairs—and to stop there. I may here point out that the South Metropolitan figures are much below the average of other undertakings referred to in the same work. As against their 12·15d., we have other figures as follows:—

Average of all the London Companies	13·64d.
„ twelve Metropolitan Suburban Companies	17·25
„ eight Corporation undertakings	15·35
„ ten large Provincial Companies	15·36

As regards the "reflex action" of the manufacture of carburetted water gas on the cost of coal gas, I may state that our best working with coal and cannel gas of 17½-candle power was 13½d. per 1000 cubic feet into the gasholder. Last year, with a candle added, the cost was 10·395d.; coal gas alone costing only 9·792d. This was due (*a*) to the giving up of the use of cannel, which was no longer required; and (*b*) to the enhanced price obtained for coke, which latter, notwithstanding Mr. Porter's theoretical doubts, has proved a practical reality.

As regards the saving in respect of capital expenditure, in addition to the items which Mr. Porter quotes, the saving in gasholder accommodation must be considered. I have during the past winter supplied a demand of close upon 8 millions per day with gasholder storage of 6 millions, without once, except by pre-arrangement, having the stock below 2 millions, and without, on any occasion, reducing the pressure by a single tenth. In doing this, it has several times occurred that close upon 1½ million cubic feet have slipped out of stock in 24 hours. This loss of reserve, which would almost have paralyzed the working of a coal-gas works, was made up with perfect ease by using additional plant, always kept in working condition during the winter months, for 36 hours.

I have no desire to attempt the conversion of Mr. Porter; and it would be idle to contend that the comparison which would hold good in one case would apply to others. Taking my own experience, I find that, in the first complete year's working after introducing carburetted water gas, the profits of the concern exceeded the previous record by £11,000; that in the following year, with an extended use of the system, this return was again exceeded by over £11,000; that the price of gas has in consequence been reduced, and could be much further reduced if such a policy were considered desirable; and that all this has been done while at the same time gas of higher illuminating power than formerly has been supplied. This is good enough for me; and I must leave Mr. Porter and those who agree with him to follow the methods which seem to them to be the most desirable in their particular circumstances.

J. Stelfox.

Belfast Corporation Gas-Works, March 5, 1897.

Sir,—Having read your reports of the recent presidential addresses and their bearing upon the all-absorbing topic of carburetted water gas, I am led to ask the following question, which I think is pertinent to the issue between the controversialists on the subject: Given that it be admitted that carburetted water gas has 5 per cent. less heating power than ordinary coal or cannel enriched gas, does it not follow that the users of atmospheric burners for any purpose must necessarily pay that amount of extra percentage with the former to obtain the results they would get by using the latter? If it be so, then the note of warning given by Mr. Porter would be accentuated, and its promoters be well asked to pause before giving another weapon to the electrician.

Cautious.

Westminster, March 5, 1897.

The Oil-Gas Process at Huddersfield.

Sir,—After perusing Mr. Hunt's paper read before the Midland Association, on "The Application of Oil for the Production of Illuminating Gas," it has occurred to me that the enclosed statement of results obtained with the oil-gas process at the Huddersfield Gas-Works may be of interest to your readers. Mr. Hunt appears to have overlooked the fact that the whole of the enrichment at these works has been done, to the extent of 3 candles, by means of oil gas or oxygenated oil gas for more than three years past, and has been in continuous operation during that period. The experiments, as enclosed, were made at a time when the oxygen plant was under repair, and are on oil gas pure and simple. They were not taken with the idea of publication, but simply to ascertain the real results of the plant.

W. R. Herring.

Huddersfield, March 4, 1897.

[Enclosure.]

Particulars of a Working Test conducted with the Oil-Gas Plant in Operation continuously at Huddersfield.

Duration of Experiments: From 9 a.m. Aug. 24, to 9 a.m. Sept. 1, 1896. (Eight working days of 24 hours each.)

Class of oil used: Scotch shale or "Blue" oil, sp. qr.	·874
Cubic feet of gas made	96,270
Weight of oil used	9139·670 lbs.
Weight of oil used	4·080 tons.
Gallons of oil used	1045·745
Gas made per ton of oil used	23,570 cub. ft.
Gas made per gallon of oil used	92·12 cub. ft.
Illuminating power, tested on standard photometer with oo burners (average of 18 separate tests of gas taken during ordinary daily work into a separate gasholder of 150 cubic feet capacity, and tested empty)	61·60 candles.
Percentage of carbon produced	15·50
Candles per gallon of oil carbonized	1135 candles.

Test on Oil-Gas Plant.

Duration of Experiments: From 12 noon Oct. 6, to 6 a.m. Oct. 17, 1896. (Eleven working days of 24 hours each.)

Class of oil used: Scotch shale or "Blue" oil, sp. gr.	·874
Cubic feet of gas made	197,100
Weight of oil used	17533·780 lbs.
Weight of oil used	7·872 tons.
Gallons of oil used	2006
Yield of gas per ton of oil carbonized	23,750 cub. ft.
Yield of gas per gallon of oil carbonized	98·00 cub. ft.
Illuminating power, tested on standard photometer with oo burner	66·25 candles.
Foot-candles per ton of oil carbonized	317,187
Foot-candles per gallon of oil carbonized	1,237
Percentage of coke	15
Make of gas per hour	805 cub. ft.
Make of gas per mouthpiece per hour	54 cub. ft.

Illuminating Power of Oil Gas made by Preceding Plant, Tested with Burners of Various Classes.

Burner.	Consumption per Hour. Cubic Feet.	Illuminating Power. Candles.	Date, 1896.
oo	2·00	59·6	Oct. 7
oo	2·16	68·5	„ 8
oo	2·22	67·4	„ 9
oo	1·90	58·0	„ 12
oo	2·24	57·0	„ 12
oo	2·20	67·4	„ 13
Pintsch	1·00	64·0	„ 13
oo	2·28	74·0	„ 14
Pintsch	0·90	70·0	„ 14
oo	2·10	71·0	„ 15
Pintsch	1·05	66·6	„ 15

Details of Compression Tests on Oil Gas made by Previous Plant; the Illuminating Power recorded being the Average throughout the Contents of the Cylinders employed.

Date, 1896.	Before Compression. Burner.	Before Compression. Consumpt. per Hour. Cub. Ft.	Before Compression. Illuminating Power.	After Compression. Burner.	After Compression. Consumpt. per Hour. Cub. Ft.	After Compression. Illuminating Power
Oct. 7	oo	2·00	59·6	oo	1·00	43·6
„ „	—	—	—	Rail. L	1·00	45·0
„ 8	oo	2·16	68·5	„	1·28	58·8
„ „	—	—	—	„	1·00	60·0
„ „	—	—	—	Rail. S	1·00	59·8
„ 9	oo	2·22	67·4	Rail. L	1·50	40·0
„ „	—	—	—	Rail. S	1·20	45·0
„ 12	oo	1·90	58·0	oo	2·70	41·0
„ „	—	—	—	Rail. S	1·10	40·0
„ „	oo	2·24	57·0	oo	2·75	40·0
„ „	—	—	—	Rail. S	1·25	35·5
„ 13	oo	2·20	67·4	oo	1·80	60·0
„ „	Rail. S	1·00	64·0	Rail. S	1·00	50·0
„ 14	oo	2·28	74·0	oo	2·00	46·0
„ „	Rail. S	0·90	70·0	Rail. S	1·20	49·0
„ „	—	—	—	„	1·00	51·0
„ 15	oo	2·10	71·0	„	1·30	50·0
„ „	Rail. S	1·05	66·6	„	1·00	51·0

Gas lost in bulk, 7·1 per cent. after compression. Average test of illuminating power, all burners, 65·77 candles before compression; 48·00 candles after compression. Loss after compression, 17·77 candles.

Structure and Luminosity of Gas-Flames.

Sir,—The following notes of a few simple experiments may not be without interest, coming after your publication of the able paper by Professor Lewes (*ante*, p. 406) dealing with the above and demonstrating the luminous decomposition of acetylene without combustion.

The results of these experiments—which were made some twelve months ago—would seem to point: (1) To the existence of a "primary luminous cone" *within* the bunsen cones. (2) To the existence of a definite "luminous zone of decomposition." (3) To the essential "three coned" structure of luminous gas-flames.

(1.) If the luminous flame of an ordinary gas-burner be turned down very low, until the luminous spot almost disappears, and then be closely observed in a dark room, this so-called "luminous tip of the inner cone" will be found to be a separate luminous cone, *completely* surrounded by the well-known bunsen cones. This primary luminous cone can be better observed in the following manner: Take a piece of ¾-inch brass tube, and file one end into the shape of a high-pommel saddle ¾-inch deep, which may be done by filing chiselwise ¼ inch on each side. If the gas be now lighted at this saddle end and then turned low, the interior of the flame can be easily observed over the high sides of the tube, when it will be seen that the luminous portion constitutes an entirely *separate* cone. If an air supply be also connected, and worked by pinching the connecting tube or otherwise, the flame may be made to travel up and down to show the development of this primary luminous cone. In this case, the acetylene formed is sufficient to give luminosity by its decomposition; the combustion of the small amount of carbon separated being effected in the surrounding bunsen cones.

(2.) When the luminous flame of a Bray's union-jet is converted into a bunsen flame by connecting an air supply, and luminosity is then induced by gradually shutting off the air, the development of luminosity is seen in a marked and beautiful manner. First the primary cone appears *within* the bunsen cones. This primary cone then develops until it forces its way through the inner bunsen cone, becoming what I have termed a definite "*zone of decomposition*," and giving rise to the luminous cone proper, in which the carbon atoms separated develop luminosity as the supply of hydrocarbon is increased, until the full flame is produced, when the "*zone of decomposition*" can scarcely be recognized by reason of the intense luminosity produced.

This experiment seems to afford striking corroboration of Professor Lewes's acetylene theory of luminosity—especially in view of his demonstration of the luminous decomposition of acetylene. The same phenomena may be observed, in a less marked manner, by converting a 5-inch flame of a Lowe's jet into a bunsen flame as above, and again watching the slow development of luminosity. Once observed, the existence of this zone, and its development in ordinary flames is easily detected.

(3.) As regards flame structure, if once it is proved that a "*primary*" luminous flame consists, as I believe, of *three* distinct cones, then it follows that a fully developed luminous flame cannot consist of less. Both Professor Smithells and Professor Lewes have now enunciated their belief in the essential two-zoned or two-coned structure of luminous hydrocarbon flames; and to trail Professor Lewes in his last paper (*ante*, p. 408), I should express myself thus: The description of a luminous gas-flame which *I* (*sic*) am most inclined to adopt, is that it consists of *three* zones—the *two* outer envelopes of combustion, and the inner region of non-combustion.

The inner zone is what I term the "zone of decomposition," in which the luminous decomposition of the acetylene takes place. Next comes the luminous zone of combustion, in which the separated carbon atoms are raised to incandescence, and probably react with water vapour from the combustion taking place in the outer zone, forming carbon monoxide and hydrogen, which go to form the outer non-luminous zone.

The luminous zone of combustion would thus appear identical in chemical character to the inner cone of a bunsen flame, which is seen at the lower part of the flame; the only difference being that in the upper part of the flame it is charged with countless atoms of carbon.

I trust you will find room for the above, as I fail to find any mention of these experiments in the literature of the subject, and more so in view of the forthcoming pronouncement by Professor Smithells.

Athol Street Gas-Works, Liverpool, March 6, 1897. H. A. Caddick.

Income-Tax Assessment on Gas-Works belonging to Local Authorities.

Sir,—I believe you would render an important service to many local authorities if you, or some of your readers, would state through the "Journal" what is the correct practice as regards allowance for depreciation or renewal of plant in making income-tax assessments. In my own case, the amount assessed as "profits" is the surplus shown by the revenue account *plus* the loan repayment and the interest on outstanding loans—the loans forming the whole capital of the undertaking. The revenue account does not include any sum set aside to meet renewals; and as the expenditure on "repairs and renewals" has for several years past not exceeded 1½d. per 1000 cubic feet of gas sold, it is obvious that there has been very little allowance made for renewal of the plant. There is, of course, a constant deterioration in the value of the plant which is not met by these small repairs; and sooner or later renewals must be made. When this occurs, the only course open to the authority is to obtain new loans; and as the expenditure of these is charged to capital account, the expense of renewals never appears in the revenue account, and consequently no allowance is made therefor in the income-tax assessment.

It appears from such accounts as I have seen published in detail, that the cost of "repairs and renewals" usually amounts to 5d. or 5½d. per 1000 cubic feet sold per annum. These being mostly large works, one can understand that the figures may represent actual expenditure, because in such cases there will generally be in progress more or less outlay on renewals. But in small undertakings—say, up to 50 million cubic feet per annum—it may well happen that there may be little or no such expenditure for several consecutive years; and I am informed by the taxing authorities that even if a sum were set aside annually out of revenue to meet renewals when required, no deduction would be made except for what had actually been expended in that way during the year under assessment. I am also informed that the Somerset House authorities have instructed the local assessors not to make any allowance for depreciation in gas-works assessments, though it appears to be clearly laid down by section 12 of the Customs and Inland Revenue Act, 1878; that they are to allow deduction "for diminished value of machinery and plant by reason of wear and tear."

Perhaps some of your readers will state their experience in this matter, or refer to any legal decisions bearing thereon that may have come under their notice.

March 2, 1897. D. S.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

The St. Anne's-on-the-Sea Gas Bill, the Deal and Walmer Water Bill, the Gravesend and Milton Water Bill, the Harrogate Corporation (Water Transfer) Bill, the Harrogate Water Bill, the Lowestoft Corporation Bill, the Lowestoft Water and Gas Bill, the Tynemouth Corporation (Water) Bill, and the Tynemouth Gas Bill have been referred to a Select Committee, consisting of Lord Poltimore (Chairman), the Marquis of Bath, Lord Colchester, Lord Ampthill, and Lord Loch; to meet on Tuesday, March 9.

The Caerphilly Urban District Council Bill, the Malvern Link Urban District Gas Bill, the Malvern Urban District Gas Bill, and the Rhymney and Aber Valleys Gas and Water Bill have been referred to a Select Committee, consisting of Lord Mendip (Chairman), the Earl of Stamford, Viscount Knutsford, Lord Manners of Haddon, and Lord Wenlock; to meet on Thursday, March 11.

A petition has been presented against the Stirling Burgh (Gas) Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:

Bills read a second time and committed: South Metropolitan Gas Bill, Weymouth Water Bill.

Bill reported: Dumfries and Maxwelltown Water Bill.

Last Thursday, the Speaker laid upon the Table of the House the report of Mr. Campion, one of the Examiners of Petitions for Private Bills, that the Standing Orders had not been complied with in the case of the London Water Companies Amalgamation Bill; and it was referred to the Standing Orders Committee.

The Ashford Gas Bill, the Ashford Urban District (Gas) Bill, the Crowborough District Water Bill, and the Weymouth Gas Bill have been referred to a Select Committee, consisting of Mr. Jeffreys (Chairman), Mr. Vaughan-Davies, Sir Cameron Gull, and Mr. D. F. Goddard; to meet on Tuesday, March 9.

In view of the second reading of the London County Council Water (Purchase) Bills, which is down for next Thursday, Mr. Bousfield has given notice of his intention to move the following amendment: "That this House, while declining to assent to the second reading of any Bill which is part of a scheme for constituting the London County Council the Water Authority for London, earnestly hopes that the intimation contained in Her Majesty's gracious Speech, that the matter would be dealt with during the present session of Parliament, will be speedily carried into effect." Mr. Holland has tabled an amendment in similar terms. In the event of the Bills passing their second reading, he will move as follows: "That it be an Instruction to the Committee—(*a*) To inquire whether, in the event of the purchase of the Water Companies' undertakings, the separation of any and, if any, of what portion of the sources and undertakings as between different authorities is desirable and feasible, having regard to present and prospective requirements; and, in the event of the Committee deciding in favour of severance, as to the best method and terms upon which such severance should be effected. (*b*) To inquire what should be the authority or authorities to manage the water supply on behalf of the water consumers, and within what area or areas."

EXAMINER'S ROOM, HOUSE OF COMMONS.

Thursday, March 4.

(*Before Mr.* Campion.)

London Water Companies' Amalgamation Bill.

This Bill, which was introduced into the House of Commons as a public measure on the 22nd of January by Sir F. Dixon-Hartland, came to-day before one of the Examiners on Standing Order proofs. Our readers are acquainted with the scope of the Bill, a full abstract of which was given in the "Journal" for the 23rd ult. (p. 427).

Mr. Cripps (of Messrs. Dyson and Co.) appeared on behalf of the London County Council, and Mr. Cameron (of Messrs. Sherwood and Co.) for Mr. Halsey, the Chairman of the Surrey County Council, in opposition to the Bill; while Sir F. Dixon-Hartland attended in person to support it.

Mr. Cripps said the ground of his opposition was that no notice had been given to the various parties interested, speaking particularly for the London County Council. He admitted the truth of the statement in the "Memorandum" attached to the Bill, that it proceeded somewhat on the lines of the Gas Act of 1860. It was true that there was an Act in 1860; but notice was given of it in the usual way. Speaking generally, there had been several cases of Bills introduced as Public Bills dealing with local legislation; but the uniform practice in regard to them had been for the promoters to give notice to all interested parties. Even Governments were not exempt from the necessity of complying with the Standing Orders; and more than one measure introduced by a Government, and dealing with matters of this kind, in regard to which notice was required, had been reported on by the Examiners, and rejected by the Standing Orders Committee. He therefore submitted that, whether Mr. Campion looked at the Bill with reference to its proposals, or with respect to the uniform practice of those who had had to deal with Bills of this character for the last thirty years, he would find that notice was indispensable. The object of the notice was to secure that, in connection with Bills dealing with private interests, which caused the getting up of long and involved cases for argument in contests before a Committee, all parties should know as early as November what it was proposed to do. He spoke with a full knowledge of these measures, and declared that, even if it was desirable that a Bill such as the present one should be passed, it would be impossible for the people concerned to do justice to the case if it were introduced without notice at the present period of the session.

Mr. Cameron supported Mr. Cripps's contention.

Sir F. Dixon-Hartland, M.P., in defending the Bill, held that it was

for the public good, and that, as there was no objection to it, the Standing Orders applicable in ordinary cases should not be enforced. No exception at all was taken to the principle of the Bill by the Water Companies, though he would not go so far as to say this with reference to all the details to which the Companies had not bound themselves.

Mr. CAMPION, in giving his decision, said: The only argument which, in my opinion, can be urged in regard to giving this Bill immunity from the obligation to comply with the Standing Orders, would be that it operates over the whole Metropolitan area. But, having regard to the subject-matter of the Bill, and considering, without going into details, that it affects the rights of the Water Companies, which are secured to them by their Private Acts, the Examiner has no alternative but to consider that the promoters should have complied with the Standing Orders as to notice in the "Gazette" and the local newspapers. This is not the first time an attack has been made on the London Water Companies.

Sir F. DIXON-HARTLAND: The Bill does not attack the London Water Companies.

Mr. CAMPION: Well, their possessions. The Bill will have to go before the Standing Orders Committee.

The measure was accordingly sent up to the Committee as having failed to comply with Standing Orders.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, March 1.

(*Before Justices* CAVE *and* WRIGHT.)

Ward v. The Plymouth and Stonehouse Gas Company.

This was an application for sequestration against the defendants for disobedience to an injunction granted by the Court about a year ago, under circumstances which were recorded in the "JOURNAL" for March 10, 1896 (p. 521).

Mr. M'CALL, Q.C. (who appeared with Mr. GRAHAM in support of the application), said the plaintiff carried on business at a large tannery establishment at Plymouth, very near to the works of the defendants. Up to 1894, though both businesses had been carried on for nearly twenty years, he had no complaint to make, except about some ammonia manufacture, which created a bad smell and injured the plant. But at the end of that year, the defendants erected a new retort-house worked by machinery; and from that time the plaintiff complained of smuts, smoke, and fine coal dust being blown from the defendants' premises into his supply of tanning and the liquor in his pits, and seriously injuring the hides which were being treated. To restrain this nuisance, he brought his action; and it came on for trial before the Lord Chief Justice on Feb. 25 last year. The defendants then submitted to an injunction; and the damages were referred to Mr. Ridley, the Official Referee, to assess. Mr. Ridley held an inquiry; and after proceeding some time, on April 25, 1896, the defendants agreed to pay £3200 for all the damages done up to that time. It was also agreed that the plaintiff should not apply for sequestration before Oct. 24; the defendants alleging that at that time certain alterations would be made which would prevent the nuisance in future. From October last until the present time, the plaintiff alleged that the nuisance had been as bad as ever, and that it was impossible for him to carry on his business. Ten affidavits were filed by the plaintiff on Dec. 5; but in consequence of the arrangements of the Court, it was impossible to bring on the case. He applied on Feb. 20 to a Divisional Court to fix a hearing, and asked that the defendants' affidavits should be delivered so that the plaintiff might be in a position to deal with them. On Wednesday last, the defendants had delivered 19 affidavits, which had been sworn a month before. He had now to submit, in the first instance, that it had been impossible for the plaintiff to get scientific witnesses to deal with these affidavits or to make affidavits in reply. The only one he had prepared in answer was one by the plaintiff himself; but as many of these affidavits were made by scientific witnesses on behalf of the defendants, raising many disputed questions of fact, it would be impossible to deal with the case satisfactorily without the witnesses being cross-examined. He should suggest, therefore, that their Lordships should refer the question on these affidavits whether or not the nuisance was continuing to Mr. Ridley, to be decided by him; he having already dealt with the matter. It might be necessary to hold an inquiry on the spot, because a great deal—especially in the defendants' affidavits—turned on the gas-works, and also on adjoining works; and it would be somewhat difficult to deal with this merely by taking maps. He would act as the Court thought convenient; but he submitted that, at some stage, the witnesses ought to be cross-examined.

Mr. CHANNELL, Q.C. (who appeared with Mr. H. E. DUKE for the defendants), said his clients were very anxious that the matter should be disposed of. He suggested, and he rather thought his friend took the same view, that at present the defendants had conclusively answered what the plaintiff set up.

Mr. M'CALL remarked that he did not take that view at all.

Mr. CHANNELL said the position of things was this: That the trial to which reference had been made, was not really a trial, because it was by consent. The action having been brought shortly after the defendants had started a new process, they fully admitted that before they got same into working order it did cause some nuisance; and, of course, it lay with the Lord Chief Justice to say whether he would try the question whether or not they had succeeded in putting an end to the cause of what admittedly had been a nuisance at the time when the action was brought. Accordingly it was suggested that, as the injunction would only go against so carrying on the work as to cause a nuisance, the better plan would be to have an order which stated on the face of it that the defendants alleged that the nuisance was then put an end to; and then there was an inquiry as to damages. This inquiry took place at Plymouth; and having spent a great deal of money in improving the works, the defendants agreed to pay £3200 damages, which was about half what the plaintiff was then claiming. Mr. Ridley probably had some recollection of what he had heard of the plaintiff's case, but he did not hear that of the defendants; so that it would not be an altogether favourable tribunal to go before a gentleman who had heard a statement on one side without hearing the other. In the result, the defendants determined to remedy the nuisance. They had spent some £5000 since then; and in their view, they had put an end to any possibility of nuisance arising. They further traced what they believed to be the true cause of the evil the plaintiff had complained of; and all this was set out in the affidavits which were delivered on the day fixed by the Court. The plaintiff came with a motion to sequestrate the Company, which would stop the supply of gas to Plymouth, on the ground that they had wilfully disobeyed the injunction; the fact being admitted that they had spent some £5000 in endeavouring to prevent the nuisance, and, as they said, they had succeeded.

Justice CAVE remarked that it was obvious this matter could not be dealt with on affidavits. There must be an examination of witnesses.

Mr. CHANNELL said he felt the difficulty. The question was whether there was any nuisance now; and, if so, what was the cause of it. His client suggested that some scientific man should be selected to decide the matter. The name suggested to him was that of Sir Henry Roscoe, a gentleman of the highest position who could be chosen. He did not know whether he would undertake to do it; but if the question were referred at all, he thought that it should be to him.

Mr. M'CALL said his client was extremely anxious that this matter should be settled at once. His business had been ruined; for since October last it was impossible for him to carry it on, and he had been obliged to discharge a considerable number of his men. The cause of this did not depend on what appeared to-day or to-morrow, or any other day, which any chemist could see. He had evidence, which he wanted someone trained to deal with evidence to hear, of what had been going on since last October. Of course, during the winter months the nuisance was much greater than during the spring and summer, as more gas was made then, and, as he was instructed, the wind was principally in the direction which made it more injurious. This evidence must be dealt with; and he submitted that this should be done by a trained lawyer. Mr. Ridley had seen the place, and knew the circumstances; and he was by far the most proper person to deal with the matter. In any event, the gentleman selected must be a lawyer, because he would necessarily have to deal with conflicting evidence as to what had happened since October last. As an example, he must point out that the defendants had made an exhibit to their affidavits of a diary, which extended over 500 pages, giving day by day the state of their works as well as that of the adjoining works.

Mr. CHANNELL pointed out that this was in answer to the plaintiff's diary.

Justice CAVE said he thought the proper course in this condition of things would be either to direct an issue to be tried, or to send it to Mr. Ridley to report. There was some difficulty about directing an issue, because they could not insist on a jury reporting on the nature of the nuisance, and finding whether it was a continuation of the previous nuisance or a different one. Inasmuch as it was a scientific inquiry, the Court had power, if an issue were directed, to refer it to Mr. Ridley; and he thought this would be the best plan. He had considered what Mr. Channell had said about a scientific gentleman; but scientific gentlemen were not lawyers, and he always objected strongly to send an inquiry to anyone who had not the requisite training to enable him to deal with it. Secondly, with regard to a scientific gentleman, it would be very difficult to find one who would go to Plymouth without thinking that he knew a great deal more about the matter than the witnesses.

Mr. CHANNELL remarked that the object was to choose a gentleman who everybody agreed did know more about it than the witnesses.

Justice CAVE said this was exceedingly undesirable. A man who approached the subject with the idea that he knew all about it already, was not likely to give that attention to the witnesses which really seemed desirable.

Mr. CHANNELL pointed out that such a gentleman would ascertain whether the defendants were right or wrong in the conclusions set out in the affidavits, that what caused the injury came from the plaintiff's own works.

Justice CAVE said he never would be a party to sending any question to be tried by a man who was not a trained lawyer. If they sent it to Mr. Ridley they could give him instructions to report to the Court on all the circumstances brought before him. Among other things he would report, first, whether there had been any nuisance since the assessment of damages; and, if so, what was the cause of it, and whether it was a continuation of the nuisance which previously existed or a new nuisance altogether.

Mr. CHANNELL said in addition to that there was a question raised by the motion as to whether the defendants had wilfully disobeyed the injunction.

Justice CAVE said that again would be a matter to be considered by the Court. Mr. Ridley's function would rather be to put before the Court the facts leading up to that question, than to decide it.

Mr. M'CALL suggested that Mr. Ridley might be directed to ascertain what damages had been sustained since October. If he found there was no nuisance, there would be an end of it. If, on the other hand, he found there had been a nuisance, it would be necessary for their Lordships, in suspending the operation of the sequestration, to know what damages the plaintiff had sustained since the last inquiry. Even if an order for sequestration were made in the usual form, it would probably be suspended for a certain time, on the terms of the defendants paying the damage already sustained.

Justice CAVE asked if there was any objection to that?

Mr. CHANNELL said he was quite willing to alter the form of the inquiry so as to put an end to the whole business; but if an order were made to refer the question to Mr. Ridley against the wishes of the defendants, he did not see why he should concede anything more to this gentleman, who, according to his view, was entirely impracticable.

Justice CAVE suggested that the question of damages should not be gone into until Mr. Ridley had found if there was a nuisance.

Mr. M'CALL agreed to this.

Mr. CHANNELL said his clients did not object; they were anxious to save expense as much as possible.

The order was accordingly made referring the question to Mr. Ridley; the affidavits which had been filed to be handed to him, and taken as evidence in-chief.

Tuesday, March 2.

Sunlight Incandescent Gas-Lamp Company, Limited, v. Incandescent Gas-Light Company, Limited.

This was a motion on behalf of the defendant Company to commit the Directors of the plaintiff Company, their Secretary and Solicitors, for contempt of Court.

Mr. MOULTON, Q.C., Mr. TERRELL, Q.C., and Mr. WALTER supported the motion; Mr. BOUSFIELD, Q.C., Mr. R. WALLACE, Q.C., and Mr. E. E. JENKINS appeared for the plaintiff Company; Mr. WARRINGTON, Q.C., and Mr. MACNAGHTEN represented Messrs. Maddisons, the Solicitors; Mr. HUNT appeared for Mr. J. M. Campbell, the late Secretary; and Mr. CARTMELL for Mr. David W. Sugg.

Mr. TERRELL said this was a motion on behalf of the defendant Company to commit certain gentlemen to prison for contempt of Court, in issuing advertisements and threats relating to alleged infringements of their patent. He understood that Mr. J. W. Campbell and Mr. David W. Sugg, who were mentioned in the notice of motion, had made affidavits in which they set out that they were not parties to the alleged threats; and that they had left the Company, and were not connected with it when the threats were made. As against these two gentlemen, therefore, he was willing for the motion to be dismissed with costs.

Mr. HUNT said Mr. Campbell ceased to have any connection with the plaintiff Company six months before the notice of motion was issued; and under these circumstances he asked for costs as between solicitor and client—the more so as solicitor and client costs were claimed against him by the notice of motion.

Justice CAVE asked why the applicants should not pay solicitor and client costs.

Mr. TERRELL said Mr. Campbell was Secretary at the time of the heavy litigation between the two Companies; and when the letter of threats was issued, signed by Messrs. Maddisons, proceedings were taken against the officers of the Company.

Justice CAVE: Did you make any inquiry as to who was the Secretary?

Mr. TERRELL replied in the negative. He said it was not the rule of the Court to give solicitor and client costs simply because a party was wrong.

Justice CAVE: But you ask for costs against Mr. Campbell on that scale.

Mr. TERRELL: I could not get them.

Justice CAVE: You must pay them. Next time you will not ask for what you cannot get.

Mr. TERRELL said the mere fact that a person asked for something he could not have, was no reason for giving another something he ought not to have.

Justice CAVE said this was a serious motion, and one which ought not to be made without some ground for believing that the parties were wrong-doers.

Mr. TERRELL having argued that the Court had no power to grant solicitor and client costs,

Justice CAVE said they would reserve the point until they had heard the motion.

Mr. TERRELL said he was going to submit that no order should be made on the motion, except that the costs should be reserved to be dealt with by the Judge at the trial of the action; and for this reason: The plaintiff had brought an action against the defendant Company for infringing Rawson's patent for stiffening mantles by dipping them in paraffin. When mantles were burnt off, they were very fragile; and the plaintiffs dipped them in liquid paraffin, which solidified round the mantles so that they became sufficiently stable to be transported. It was alleged that the defendants, in stiffening mantles by the use of collodion, had infringed Rawson's patent; and an action had been commenced. The defendants alleged that the action was a frivolous one, and that it was not *bonâ fide*, but was brought merely for the purpose of enabling the plaintiffs to issue threats. A large number of notices had been sent to people all over the country, threatening them with actions if they bought the defendants' mantles.

Justice WRIGHT: Is the ground of the motion that it will interfere with the fair trial of the action?

Mr. TERRELL: No; I cannot say that, as the case will be tried by a Judge without a jury, and it does not affect witnesses.

Justice CAVE: Why is it a contempt of Court?

Mr. TERRELL: I do not say it is contempt of Court.

Mr. WALLACE: Then I ask that the motion should be dismissed with costs.

Mr. TERRELL: The Court of Appeal held that a patentee threatening an infringer is entitled to do so provided he has brought an action on his patent; and that is why I am not able to ask your Lordships now to make an order on the motion. Your Lordships would have to go a step further, and find that the threats were made not *bonâ fide*, but for an ulterior purpose altogether, before you could make an order restraining the threats, or for committal. If at the trial the Judge thought the action had been brought merely for the purpose of issuing threats, he would give the defendant Company the costs of this motion; if not, he would order them to pay them. The defendants could not proceed with the motion unless they were prepared now to try the whole action, to show that it was merely vexatious.

Justice CAVE: Under these circumstances, you must pay the costs of all the respondents except the Company.

Justice WRIGHT: What possible jurisdiction have we, if there is no contempt of Court?

Mr. TERRELL: There is a contempt in this sense: They have brought an action against us for infringement of their patent. We say we have not infringed; and that is the issue to be tried before the Court. Then the plaintiffs issue the advertisements complained of.

Justice WRIGHT: What jurisdiction have we?

Mr. WALLACE: None.

Mr. TERRELL said there was power at Common Law to restrain a person issuing threats which were in the nature of trade libels.

Justice CAVE said the motion must be dismissed with costs as against the individual respondents; but as to the Company, the Judge would deal with the costs at the trial.

Mr. WALLACE said that would have been fair if this had been a motion to restrain the issue of advertisements; but the motion was of a different kind—it was to commit for contempt the Directors and Solicitors.

Justice CAVE: As the Directors and Solicitors will get their costs, they cannot ask for more.

Mr. WALLACE said that was so.

Justice CAVE: As far as the Company are concerned, it is suggested that the Judge at the trial will know more about the case than we do.

Mr. WALLACE said there was no issue on that point at all.

Justice CAVE: Suppose we dismiss the motion with costs as against the Directors and Solicitors, and dismiss it with costs as against the Company unless the Judge at the trial otherwise directs.

Mr. WALLACE thought that when persons were charged with so serious a matter as contempt of court, they were entitled to have the matter disposed of at once. The motion was wholly misconceived. If their Lordships thought the costs of the Company should be dealt with by the Judge who tried the action, he would consent to that course being adopted.

Mr. CARTMELL, on behalf of Mr. Sugg, asked for solicitor and client costs.

Mr. MACNAGHTEN made a similar application on behalf of Messrs. Maddisons.

Justice CAVE said the application, which it was admitted ought not to have been made, must be dismissed with costs as against the individual defendants; and as against the Company it would be dismissed with costs, unless the Judge at the trial, upon the evidence before him, thought fit to make a different order. To give him that opportunity, execution of that part of the order would be stayed until the case came before the Court or was otherwise disposed of. If it did not come before the Court, then the order for the costs of the Company would stand. With regard to the application for costs as between solicitor and client, it was doubtful whether the Court could make such an order. Frivolous and vexatious motions had been well known to the Courts for many years; but no one had produced an authority where a person, having had his action dismissed on the ground that it was frivolous and vexatious, had been ordered to pay the costs as between solicitor and client. This being the case, he certainly did not think the Court ought to begin to make such a practice now.

In re an Arbitration between the Matlock Bath Gas Company and the Matlock Bath Urban District Council.

This was an application on behalf of the Matlock Bath Gas Company that the award made by the Arbitrator (Sir W. Coddington, M.P.) on the subject of the purchase of the Company's undertaking by the District Council, might be referred back to him, in order that he should include various items, comprising book debts to the amount of between £800 and £900.

Mr. HEXTALL, in support of the application, said the award was made on the 8th of December for the amount of £16,750, and was based upon evidence given before the Arbitrator, which was directed solely to the value of the works and plant. It was virtually agreed that there had been a mutual mistake—the book debts, stock, and balance at the banker's not being included in the award; and the sole question now was who should pay the costs.

Mr. MARCHANT, who appeared for the District Council, admitted that the items in question had not been taken into account by the Arbitrator; and consequently, he said, he did not wish to oppose the application. But the fault lay entirely with the Company. The Act obtained by the Council last year provided for the sale of the undertaking at a price to be agreed upon; and it was clear that the word "undertaking" included the items in question. The account before the Arbitrator was prepared by Mr. Alfred Lass; and in it there was reference to the assets in question. No doubt the real finding was as to the value of the works and plant as a commercial undertaking; the stock of coal and residuals being of comparatively small amount. It was for the Company to have brought before the Arbitrator evidence on these matters, as it was to their interest to make the award as large as possible; but no such evidence had been given. Under these circumstances, he thought the Company should bear the costs of the matter going back.

Justice CAVE asked whether the parties could not agree upon the value of the things, without the matter being referred to the Arbitrator.

Mr. MARCHANT said there was a difficulty about so doing, because, unless the amount was included in the award, the Auditor might surcharge it against the members of the Council.

Mr. HEXTALL said the Company were willing to take the amount at £800, and to agree that the parties should bear their own costs.

Justice CAVE said the case must go back to the Arbitrator to fix the amount; and the question of costs would be reserved. When the Court came to deal with these, it would require to know what amount the Company asked, what the Council offered, and how much the Arbitrator awarded. He would suggest that the parties should agree upon an amount, in which case the costs would be very trifling indeed.

Illegal Use of Gas at Accrington.

At a recent sitting of the Blackburn County Police Court, a resident of Great Harwood, named Henry Marsden, was summoned by the Accrington Gas and Water Board for illegally obtaining a supply of gas. The defendant, who is a reed-hook and shuttle-tip brazier, adopted the old device of using an india-rubber tube to obtain gas from the mains without it passing through the meter; and he was found out by an inspector of the Board who made a surprise visit to the place. According to the meter, the defendant had consumed no gas during the current quarter; and on his being challenged with an illegal consumption, he offered to give anything if the inspector would say no more about it. Before the Magistrates he pleaded "Guilty," and begged to be dealt with leniently. Replying to the Magistrates, the Board's inspector said he first had suspicion of defendant's using gas illegally in 1895; but, as a rule, he could not get into the house, owing to the doors being locked. When he went on the 11th of February, he happened to find the back door open, and he went straight to the meter. Gas, he added, was necessary for defendant to carry on his business. The Magistrates considered the case a very bad one; and they fined Marsden £5 and costs, and £1 damages, or two months' imprisonment in default of payment.

COURT OF SESSION—OUTER HOUSE.—Tuesday, March 2.

(*Before* Lord Low.)

James M'Kelvie and Co. v. The Arniston Coal Company, Limited. Breach of a Cannel Contract.

Judgment was given in the action by Messrs. James M'Kelvie and Co., cannel, gas, and steam coal merchants, of Haymarket, Edinburgh, against the Arniston Coal Company, Limited, whose registered office is at 10, St. Andrew Square, Edinburgh. The pursuers brought the action to recover £1250 as damages for alleged breach of contract. The facts of the case are fully rehearsed by the learned Judge in giving his decision.

The pursuers were represented by Mr. Balfour, Q.C., Mr. Dundas, Mr. Salvesen, and Mr. Deas; and the defenders, by the Dean of Faculty (Mr. Asher, Q.C.), the Solicitor-General for Scotland (Mr. Scott-Dickson, Q.C.), and Mr. Trotter.

The witnesses examined for the pursuers were: Mr. James M'Kelvie, of the pursuers' firm; Mr. Joseph Hepworth, of Edinburgh; and Mr. G. R. Hislop, of Paisley. Those for the defenders were: Mr. R. Orr, of Glasgow; Mr. A. Russell, of Glasgow; Mr. J. C. Chisholm, Solicitor, of Edinburgh and Dalkeith; Mr. J. Malcolm, Manager for the defenders; and Mr. J. D. Hislop, clerk to the defenders.

Lord Low, in giving his judgment, said: There was first a contract between the pursuers and the defenders for 2000 tons of Arniston cannel, the terms of which are set out in the letters passing between them on the 2nd and 3rd of May, 1895. Subsequently the amount was increased to 3000 tons; and a letter was written to the pursuers by the defenders on the 16th of May which embodied the terms of the contract as regarded the whole 3000 tons. The important part of the letter was as follows: "Delivery during the next twelve months; and we are not to supply cannel to Bremen, directly or indirectly, during subsistence of the contract. You are not to offer any further cannel of our class required for Bremen, during the currency of the contract, except from us; and you agree to do your best to place it there." The first question is: What was the effect of the defenders' undertaking not to supply cannel to Bremen, directly or indirectly? The pursuers contended that it amounted to a warranty that no cannel from their colliery should find its way to Bremen. I do not think that the language used supports this construction. What the defenders undertook was not to "supply" cannel to Bremen. The word "supply" seems to me to refer to what the defenders were themselves to do, and to limit the undertaking to matters over which they had control. Then there are the words "directly or indirectly." I think that the defenders undertook absolutely not to supply cannel to Bremen themselves; and also undertook that they would use all reasonable precautions that cannel which they sold to others should not, in fact, be supplied to Bremen. What would amount to reasonable precautions would depend upon the circumstances; but I may say that I agree with the view for which the defenders contended to this extent—that in the absence of circumstances pointing to the necessity for more stringent measures, the defenders would have sufficiently discharged their obligations to the pursuers by intimating to traders inquiring for Arniston cannel that, so far as they were concerned, that market was closed, and by taking these traders bound in the same obligation as that which they had themselves undertaken to the pursuers. The defenders supplied three cargoes of coal to Messrs. D. M. Stevenson and Co., all of which were sent direct to Bremen. The first cargo was dispatched from Leith on July 13, 1895, by the "Ancient Briton;" the second, on Oct. 7, by the "Coral;" and the third, on Oct. 17, by the "Ashington." In respect of these three cargoes, the pursuers claim damages on the ground of breach of contract. It appears that the chief, if not the only, buyer of cannel coal in Bremen is the Gas Company there; and it was in view of being in a position to sell upon advantageous terms to them, that the pursuers stipulated for a monopoly of the Bremen market. The Bremen Gas Company, according to their custom, invited tenders for the various kinds of coal which they required, in the month of May. The amount of Arniston cannel for which the Gas Company invited tenders was 3000 tons; and this was the reason why the pursuers increased the amount under their contract with the defenders from 2000 to 3000 tons. Besides Arniston cannel, the Gas Company invited tenders for a number of other kinds of coal. The pursuers, on May 13, put in tenders for the Arniston cannel, and also for other kinds of coal, including Niddrie No. 1 cannel. The offers were opened by the Gas Company on the 15th of May; and it was found that a Mr. Suhren, of Bremen, had tendered the lowest price for Arniston cannel. His offer was therefore accepted. Mr. Suhren is the agent of Messrs. Stevenson in Bremen. The pursuers' offer for Niddrie No. 1 was also accepted. The acceptance, however, was not intimated to them until June 4; and the contract was not signed until the month of August. The price tendered by the pursuers for the Arniston cannel was the next lowest to that tendered by Suhren. As the pursuers had obtained from the defenders a monopoly of the Bremen market, they assumed that Suhren would either be compelled to withdraw his offer, or to come to them for the coal. At the time when the defenders made their first contract with the pursuers, their Manager (Mr. Malcolm) was in negotiation with Messrs. Stevenson to supply them with cannel coal for the Bremen Gas-Works. The first letter produced is dated April 30, 1895, in which Messrs. Stevenson say that they are asked to offer about 7000 tons of Arniston cannel to the Bremen Gas-Works. On the 1st of May, Malcolm replied that the defenders would be pleased to let them have their very lowest offer for the coal. It was upon that day Malcolm had a meeting with the pursuers, and agreed to sell to them 2000 tons of cannel, and to give them a monopoly of the Bremen market. One would have expected that, having made that contract with the pursuers, Malcolm would have told Messrs. Stevenson that he could not sell cannel to them for the Bremen Gas-Works, as he had already given another trader the monopoly of that market. He did not, however, do so, but continued to negotiate with Messrs. Stevenson upon the footing that, if a price could be agreed upon, the defenders would supply them with coal for the Bremen Gas-Works. Malcolm in his evidence said, in effect, that he did not want Messrs. Stevenson to know that he had passed them over in favour of the pursuers. That may be the explanation of his conduct; but not the less is it clear that he did not act in a straightforward way. If he had at the time informed Messrs. Stevenson that he had sold cannel for the Bremen Gas-Works, and that he had given an undertaking not to supply it to Bremen through anyone else, it is very possible that Messrs. Stevenson would not have put in a tender for the Bremen contract, in which case the present question would never have arisen. Throughout the months of May and June, Messrs. Stevenson kept pressing Malcolm to name a price which they could accept, and repeatedly reminded him of a promise which he had made to put them on as good terms as anyone else. On the 4th of July, Messrs. Stevenson telegraphed to Malcolm: "Germany buyer accepts 5600 tons shipment Monday. Might place good deal more later if price reduced." On the same day, Malcolm replied: "Price here 21s. 6d., but not for Bremen." This was rather a curious answer. Up to that date, Malcolm had never said in words that he would not sell for Bremen. He had merely kept Messrs. Stevenson at arm's length by asking a prohibitive price. Now I think he must have seen that Messrs. Stevenson's telegram referred to the Bremen Gas-Works, because in the correspondence there is no trace of any other buyer in Germany. Why, therefore, did he not simply say that his Company could not sell for Bremen? Why did he, while barring Bremen, also quote a price which he knew that Messrs. Stevenson would be prepared to give? It looks very much as if Malcolm was trying to keep the letter of his contract with the pursuers, and at the same time to give a cargo to the Stevensons, although he had reason to suspect that it would find its way to Bremen. Upon the same day, July 4, Messrs. Stevenson again telegraphed: "Accept 550, shipment Monday. Can you meet us here to-morrow morning, to help work buyer for further quantity?" It is to be observed that Messrs. Stevenson said nothing in the telegram about the coal not being for Bremen. Probably, however, Malcolm was at that time entitled to assume that the acceptance was in terms of the offer, though I do not think that there is much doubt that Messrs. Stevenson had made up their minds to send the coals to Bremen, if they possibly could do so, notwithstanding Malcolm's prohibition. The next day Malcolm went to Glasgow to see the Stevensons; and he gave the following account of the interview: "I went through to Glasgow and met Mr. Stevenson as arranged. I was at first shown into his private office; but I was shown out again, and Mr. Stevenson said at the time: 'Stupid man, to put you in here. The man that is wanting to purchase the coal is here just now; and you had better go into the public room until I have time to see you.' I went out, and after a time Mr. Stevenson came out to the street; and when he had gone up the street a bit, he asked me why I did not sell the coal to him for Bremen. I told him that I could not sell him the coal for Bremen; and that I would not do so, though he were to give me 30s. a ton for it. We then went back into the office; and he began to negotiate for the purchase of 5000 tons of cannel. His brother George and he were both there; and we agreed that it would be in his option to purchase 5000 tons within a month. We fixed on the price; and he went away, and brought back a type-written letter containing the words: 'I withdraw my telegram of yesterday,' and also stating that I would allow him to send to Bremen. But I said that I would not sign that letter; and I did not sign it. He then went and wrote another letter, which is the letter of the 5th of July." The letter of the 5th of July is in the following terms: "We confirm having received your offer of any quantity not exceeding 5000 tons, excluding next week's shipment, of your best Arniston large cannel coal, at the price of 21s. 6d. per ton free on trucks, or 22s. 11d. per ton f.o.b. Leith; for shipment at our convenience within the next twelve months, on your getting reasonable notice—say, at the rate of 300 tons per day—to prepare cargoes. This offer is binding on you for a month from this date. We are not to sell any of this coal to the Bremen Gas-Works."

The defenders' case is that, by taking that letter from Messrs. Stevenson, they implemented their obligation to the pursuers. The Messrs. Stevenson are coal merchants in large business; and the defenders say that they had no reason to suspect their honesty, or that they would not adhere strictly to the undertaking not to sell any of the coal to the Bremen Gas-Works. I think that this view is entitled to a great deal of weight; and if it had not been for the preceding conduct, both of Malcolm and the Stevensons, I should have given effect to it. Malcolm, however, by giving no reason for not giving the Stevensons a cargo for Bremen, led them to believe that it was all a question of price, and that a contract would probably be arranged in the end. The Stevensons accordingly, throughout the months of May and June, kept very persistently pressing Malcolm for a cargo. Then at the meeting in Glasgow, Mr. Stevenson, on Malcolm's own showing, was guilty of very sharp practice, because, though Malcolm had told him distinctly that he could not sell coal to him for Bremen, he tried to palm off upon Malcolm a letter in which Bremen is allowed. All that should have made Malcolm very careful to see that in the end there was no dubiety as to what the position of matters as regarded Bremen truly was; and I do not think that the letter of the 5th of July (which was also prepared by Mr. Stevenson) was unambiguous. What Messrs. Stevenson said in that letter was: "We are not to sell any of the coal to the Bremen Gas-Works;" and they maintained subsequently that they had not done so. In one sense that was the case, because they only sent the coal on to Suhren, in order that he might implement the contract which he had made in his own name with the Bremen Gas Company. Accordingly, when they were afterwards challenged by the defenders for having sent the coal to Bremen, they wrote, on July 17: "We have kept strictly within the limits prescribed to us—viz., not to sell any of this coal to the Bremen Gas-Works." I do not say that Messrs. Stevenson acted honestly; but I think that it was Malcolm who gave them an opening to act as they did. He began by deceiving the Stevensons; and his undecided attitude encouraged them to keep pressing the matter, in the hope that they would get a contract in the end. As I have shown, they tried at the Glasgow meeting to get out of the conditions as to Bremen, in a not very creditable way; and finally they got Malcolm to accept the letter of July 5. I have no doubt that the clause in that letter referring to Bremen was framed by Mr. Stevenson, with the view of evading the conditions which Malcolm wished to impose. If Malcolm had insisted that it should be distinctly stated in the letter that the coal should neither be sold by the Stevensons to the Bremen Company, nor sold or consigned to anyone to be taken to Bremen, I think that it is very possible that it would not have been sent, or that the Stevensons would have broken off negotiations. I think that the clause in the letter which Malcolm accepted did give the Stevensons

a pretext for saying that they did not break their obligation, because they did not thereafter sell any of the coal themselves to the Bremen Gas-Works. Of course, that was a quibble; but I can understand the Stevensons regarding it as no more than a sharp stroke of business, whereby they got the better of Malcolm. I have, therefore, come to the conclusion, though not without difficulty, that the defenders did not take the precautions which they might have taken, and ought to have taken, to prevent the coal which they sold to the Stevensons being sent to Bremen. But the defenders plead that the pursuers are barred from claiming damages for breach of contract, because they accepted a letter which the defenders gave them on July 15 authorizing them to take proceedings in the defenders' name either to prevent the coal sold to the Stevensons being delivered to the Gas Company, or otherwise to sue the Stevensons for breach of contract in name of the defenders. The letter then proceeded: "In consequence of this arrangement, you will undertake to relieve this Company from the consequences and expenses of the said proceedings, and also all claims for damages at your instance against this Company." There is an unpleasant conflict between the evidence of Mr. M'Kelvie and the defenders' witnesses, as to what passed when that letter was written and handed to the former, and also in regard to what happened at a meeting upon the previous day. I am of opinion, however, that the correspondence, which is the most reliable evidence in the case, shows that the pursuers did not accept or act upon the letter. On the 17th of July, the pursuers returned the letter to the defenders. The following day the defenders' solicitor, Mr. Chisholm, sent it back. Mr. M'Kelvie was from home at the time; but upon his return on July 22, he wrote again returning the letter, and saying: "It was distinctly understood at the meeting that we would not agree to the terms mentioned in your letter, unless we found that we were able to interdict the cannel going to the Bremen Gas-Works. When you asked for a reply as soon as possible, Mr. M'Kelvie mentioned that he had wired again, and would have an answer in two hours; but the fact of his not giving an answer within that time, did not imply that he had accepted the terms of the said letter. As a matter of fact, Mr. M'Kelvie telephoned at five o'clock on the date referred to, but was told you had left the office. That the letter was not returned on Tuesday morning, was owing to a misunderstanding." On July 23, Mr. Chisholm replied: "I am in receipt of your letter of the 22nd inst. It was distinctly understood that Mr. M'Kelvie was to let me know within two hours if he did not agree to the terms contained in my letter of the 15th inst. I do not think the Company could have acted more fairly in the way of protecting you than in the arrangement contained in my letter to you of the 15th inst." I think these letters show that Mr. Chisholm had misunderstood what Mr. M'Kelvie meant when he said that he would communicate with him in regard to the letter in two hours. The probability is that Mr. M'Kelvie actually took up the position which he states in his letter of the 22nd of July. If he could have interdicted the coal going to Bremen, his object would have been accomplished; and to this extent he might very well have agreed to take proceedings at his own risk in the defenders' name. But if he had accepted the letter *in toto*, and had failed to obtain interdict against the coal being delivered at the gas-works, he would have had no remedy at all. The defenders no doubt would have had a claim of damages for breach of contract against the Stevensons; but I do not see how they could have proved more than nominal damages, except upon the ground that they had been found liable in damages to the pursuers. The pursuers, therefore, were asked to give up all claims against the defenders without any equivalent. It would have been very extraordinary if an experienced business man like Mr. M'Kelvie had accepted such a proposal. Although the defenders subsequently founded upon the letter of July 15, in circumstances to which I shall afterwards refer, I think that Mr. Chisholm's letter of July 23 closed the incident. Though he stated his understanding of what had passed at the meeting, and expressed the opinion that the defenders could not have acted more fairly, he acquiesced in the return and repudiation of the letter by the pursuers.

I have hitherto been dealing only with the part of the cargo of the "Ancient Briton," which was purchased by the Stevensons; but a portion of this cargo was purchased from the defenders by Messrs. Russell and Co., which to a certain extent is in a different position. The defenders sold some 600 tons of Arniston cannel to Russell and Co.; but in their case they stipulated distinctly that it was not to be sent to Bremen, directly or indirectly. They also told Russell the reason why they made this stipulation—namely: "We have already offered our cannel there through another agent." The only reason which I can see for Malcolm telling Russell he had sold coal for Bremen to another trader, and concealing the fact from the Stevensons, was that the latter had a much larger business than the Russells; and Malcolm was afraid of injuring the defenders' connection with them. Messrs. Russell accepted the defenders' conditions, and in turn sold to Messrs. Stevensons upon similar conditions. In regard to what happened subsequently, Mr. Alexander Russell gave the following evidence: "In the beginning of July, Messrs. Stevenson asked me for certificates of shipment for the coal per the 'Ancient Briton.' I asked to see the charter; and the charter stated distinctly 'Hamburg or Bremerhaven.' I asked Stevenson if it was to go to Bremen; the pursuers having stated it was going there. Stevenson stated that it was going to Bremerhaven; but that his agent could send it inwardly as he thought proper. I said 'Yes! bar Bremen.' Stevenson agreed to that; and said it was all nonsense to talk about its going to Bremen. I honestly believed it was not going to Bremen." I do not doubt that Russell acted honestly in the matter; and I think that the defenders were entitled to trust to his honesty. If, therefore, they had known nothing further about the coal than that they had sold it to him upon the conditions which I have mentioned, I do not think they would have incurred any liability to the pursuers. But the defenders knew that Russell had re-sold the coal, and they knew also that it was going in the "Ancient Briton." This must have suggested that the coal was sold to the Stevensons—especially seeing that in an early letter Russell had told them that he wanted to buy for Bremen. If the defenders had asked Russell to whom he had sold the coal, I see no reason to suppose that he would not have told them. It therefore seems to me that, before the "Ancient Briton" was dispatched, the defenders were put upon their inquiry as regarded the coal sold to Russell, just as much as regarded the coal sold to the Stevensons; and as they allowed both consignments of coal to be sent off without taking the precautions which the circumstances suggested, I do not think that they can escape liability in regard to the one parcel of coal any more than in regard to the other.

I now come to the coal which was dispatched by the "Coral" and the "Ashington." On the 15th of July, 1896, Mr. Chisholm wrote to Messrs. Stevenson saying that he had heard from the pursuers that the "Ancient Briton" cargo had been sent to the Bremen Gas-Works, and intimating that he held them liable in damages for breach of contract. In reply, Messrs. Stevenson wrote the letter of July 17, to which I have already referred, in which they said that they had kept strictly within the limits prescribed to them. They also complained that Malcolm had "encouraged us to try to secure the contract, if possible on the relative basis of the price which he believed your neighbours were asking, on the understanding that we would get your coal from time to time at the lowest price you were willing to take for any market." After considerable correspondence, to which it is not necessary to refer, the Stevensons wrote to the defenders on Aug. 2: "Referring to your offer of the 5th ult., we have pleasure in accepting a further 1000 tons or thereby. . . . . Our German friend came here as arranged, and left in the evening for Hamburg. He expects to have some news for us by Monday regarding a further quantity." The letter of the 5th ult. there referred to was the letter which Stevenson gave to Malcolm at Glasgow, and which I have already quoted. The "German friend" was obviously the "German buyer" referred to in Mr. Stevenson's telegram of July 4, to whom the cargo of the "Ancient Briton" was sent. It is plain that Malcolm understood that the destination of the coal wanted by Messrs. Stevenson was to be the same as that formerly supplied, because upon Aug. 3 he wrote: "We cannot let you have our Arniston cannel if you send or intend sending it to Bremerhaven, Bremen, or the Bremen Gas-Works, either directly or indirectly, by ship or otherwise. Also before we send any cannel to you, or to your order, you must first give us a guarantee of £300 (three hundred pounds sterling), which sum must be lodged in the hands of a neutral party to our satisfaction. Should you, or anyone on your behalf, place our cannel at the above ports or works, you forfeit the above mentioned sum of £300, in addition to the price of coal sent, which coal must be paid for on delivery at ship's side before being shipped." I think that this letter shows that Malcolm then recognized that, in order to carry out the contract with the pursuers, it was necessary, as regarded the Messrs. Stevenson, to do more than take their obligation not to send the coal to Bremen. The Messrs. Stevenson, however, wrote on Aug. 5 that they could not agree to the new "conditions which you seek to introduce;" and from that time Malcolm said nothing more about a guarantee. In replying to the Stevensons' letter of Aug. 5, however, Malcolm wrote on the 6th: "With regard to the remarks in your reply to ours of Saturday, we certainly will not deliver our Arniston cannel to you should you either directly or indirectly send, or intend sending, it to the Bremen Gas-Works." The answer which the Stevensons wrote to that letter was of itself, I think, sufficient to show Malcolm that they could not be trusted not to send the coal to Bremen, because they said: "We cannot interfere with what our buyer may choose to do with the coal, which will be taken delivery of strictly in terms of our offer of the 5th of July." Now, as I have already pointed out, their offer of the 5th of July was "not to sell any of their coal to the Bremen Gas-Works;" and the letter which I have just quoted was a plain enough intimation that the Stevensons' view was that, while under that letter they could not themselves sell to the gas-works, they could sell to an intermediary who might do so. On Aug. 21, Malcolm wrote: "When you carry out our agreement—viz., that you will not sell any of this coal to Bremen or the Bremen Gas-Works—we will then be able to arrange amicably regarding next delivery." So far, Malcolm, though he had given up his demand for a money guarantee, was standing firmly enough to the stipulation that the coals should not be sent to Bremen. On Aug. 22, however, the Stevensons wrote him a letter which probably had a material influence upon the future course of events. They said: "We now understand that unless we agree to the new conditions which you lay down, you will not deliver to us, and therefore we are not bound to take from you, the quantities purchased. We hope to arrange accordingly; holding you responsible, of course, for any prejudice we may sustain." What the Stevensons there call "the new conditions," were conditions as to Bremen going beyond the letter of July 5, as they interpreted it. After this letter, I think that Malcolm should have broken off negotiations, because looking to what had happened in regard to the "Ancient Briton" cargo, he must have seen that the Stevensons were intent upon evading the conditions as to Bremen.

Nothing further of importance happened until Sept. 23, when the Stevensons wrote: "We have just received a telegram from Hamburg, instructing us to order 1000 tons of Arniston cannel for shipment. . . . Please forward accordingly, and wire us confirmation in the morning. P.S. The cannel has been resold to Mr. G. Suhren, coal merchant, of Bremen." There was no concealment there; and accordingly Malcolm telegraphed to the Stevensons: "Cannot supply cannel to Bremen or the Bremen Gas-Works, neither through you nor Suhren." Stevenson then had an interview with Chisholm and Malcolm, the result of which was thus stated in a letter by the latter dated Sept. 28: "With reference to your conversation with Mr. Chisholm and me yesterday, I beg to confirm what was stated then to you—viz., that this Company is quite willing to deliver to you the balance of your contract for cannel coal, on your paying the account at present due by you, and on the distinct understanding that the coal is not to go to the Bremen Gas-Works, as stipulated in the contract." The last words I take to refer to the letter of July 5; and by agreeing that the condition as to Bremen should only be as stipulated in that letter, the Stevensons were put in the very position which they had been admittedly aiming at all along—the position, namely, of being only bound (as they read the letter of July 5) not themselves to sell to the Bremen Gas-Works. The result was that 472 tons were sent in the "Coral" on Oct. 7, and 1088 tons in the "Ashington" on Oct. 17; and both of these cargoes went to Suhren for the Bremen Gas-Works.

I shall now turn for a moment to the correspondence between the defenders and the pursuers, about the time when the former were agreeing to give a cargo for the "Coral." On Aug. 26, Malcolm wrote to the pursuers asking if they were likely to take up a shipment of the 3000 tons bought. He added: "D. M. Stevenson and Co.'s plea is that you,

not having sold the coal, have no claim for damages as regards any loss sustained through the shipping to either Hamburg or Bremen works. As they are again pushing us for another shipment, which we believe is for Bremen, we refuse in meantime to let them have it until we hear from you." This was quite a straightforward letter; but it shows that Malcolm was admittedly negotiating with the Stevensons in regard to coal which he believed was intended for Bremen. In reply, the pursuers referred to their contract, said they had nothing to do with Stevensons, and that they expected to have a shipment early in September.

On Sept. 20 the pursuers telegraphed to the defenders: "Copy telegram received from Bremen: 'Suhren receives order, delivering next Arniston fortnight, balance four weeks.'" Malcolm answered on the same day: "We will attend to above advice." On Sept. 28, the day on which Malcolm wrote to the Stevensons, agreeing to give them a cargo, he also wrote to the pursuers as follows: "With reference to our letter to you of July 15, I think it right to inform you that Messrs. D. M. Stevenson and Co. are at present asking for delivery of an additional quantity of cannel coal in terms of their contract. This Company will stipulate, as formerly, that the coal is not to be sold to the Bremen Gas-Works; but this intimation is made to you in case you may desire to take any proceedings in terms of the letter to you of July 15. The Company will give you any further information which you may desire." Now when that letter was written, Malcolm knew that the pursuers had returned the letter of July 15, and refused to act upon it. Further, I think that it is plain that the letter of July 15, referred only to the "Ancient Briton" cargo, and not to all future transactions which the defenders might enter into with the Stevensons. It seems to me that the inference is that Malcolm had made up his mind to give the Stevensons a cargo, and that he wrote to the pursuers referring to the letter of July 15, simply with the view of escaping from liability to them. It was argued, however, that, even assuming that the defenders broke the contract, the pursuers cannot claim damages because they did not implement their part of the bargain. The defenders' letter of May 16, contains this sentence: "You are not to offer any further cannel of our class required for Bremen, during the currency of the contract, except from us; and you also agree to do your best to place it there." The defenders say that the pursuers did not do their best to place the Arniston cannel at Bremen, and that after the date of the contract they sold other coal of the same class—viz., Niddrie No. 1—to the Gas Company. Now after making the contract of May 2, with the defenders for 2000 tons, Mr. M'Kelvie went to Bremen and tendered for all the Arniston cannel which the Gas Company wanted. The tender must, I think, have been a reasonable one, because the only tender at a lower price was that of Suhren; and if the defenders had not sold to the Stevensons, I think that there is no doubt that either the Gas Company or Suhren would have had to come to the pursuers for the coal. Again, when the defenders took to supplying the coal to the Stevensons, I think that they put it out of the pursuers' power to place it at Bremen. In regard to Niddrie No. 1, which the pursuers sent to Bremen, I have already said that the pursuers had tendered for the Niddrie No. 1 which the Bremen Gas Company required; and that after the contract of May 16, they did nothing more than carry out the tender. In doing so, I do not think that they violated the condition that they were not to offer any further cannel of the defenders' class required for Bremen, even assuming (what is not at all clear) that Niddrie No. 1 was of the same class as Arniston cannel.

Upon the whole matter, I am of opinion that the defenders broke their contract with the pursuers as regarded all the cargoes; and I do not think that it is doubtful that, but for the defenders' breach of contract, all the orders for the Bremen Gas-Works would have come to the pursuers. I, therefore, think that they are entitled to damages; and upon a careful consideration of the evidence, a fair sum to allow appears to me to be £300.

Charge of Stealing Gas.

At the West London Police Court last Wednesday, before Mr. R. O. B. Lane, Q.C., Robert Mail, whose right name is said to be Atkins, a decorator, residing in Haydn Park Road, Shepherd's Bush, was brought up on a charge of stealing gas at 31, Spencer Road, Acton. Mr. O. Hanson prosecuted on behalf of the Brentford Gas Company; Mr. H. Perrin defended. The premises were examined, and in the cellar it was found that a connection had been made to the service-pipe, which had been left sealed, by the usual piece of tubing attached to a short pipe and an iron ring. It was proved that on two occasions the ring was used for heating water. It further appeared that the house, which belonged to the prisoner's mother, had been unoccupied for some time; but the prisoner had used it for the storage of materials. Mr. Perrin submitted that there was no case. He said there was not any proof that the connection was made by the prisoner, who found it in the house, which he was putting in repair for a tenant. Mr. Lane admitted that the case was slight, but said there was sufficient evidence for a jury. He committed the accused for trial, but allowed bail.

Acetylene Gas Corporation, Limited.—Under this title, a Company has been registered with a capital of £150,000, in £1 shares, "to adopt and carry into effect an agreement, expressed to be made between the Acetylene Trust, Limited, of the one part, and the Company of the other part, for the acquisition, by purchase or otherwise, of the letters patent Nos. 12,046 and 12,047 of 1896, for an improved method of, and apparatus for, generating acetylene gas, or any interest therein, and to apply for, purchase, or otherwise acquire any other letters patent, licences, or concessions, or any inventions capable of being used for any of the purposes for which the inventions specified in such letters patent can be used; to manufacture, sell, supply, and deal in gas, and the apparatus and chemical or other substances used for generating gas in the United Kingdom, or in any colony or dependency, and to carry on the business of a gas-works company in all its branches; to deal with, manufacture, and render saleable coke, coal, tar, pitch, asphaltum, ammoniacal liquor, and other residual products obtained in the manufacture of gas; to construct and maintain works for holding, receiving, and purifying gas, and all other buildings and works, meters, pipes, fittings, machinery, apparatus, and appliances convenient or necessary for the purposes of the Company; and as manufacturers of gas-stoves and gas-engines."

MISCELLANEOUS NEWS.

LIVERPOOL CORPORATION AND CARBURETTED WATER GAS.

Report by Mr. C. R. Bellamy.

At the Meeting of the Lighting Committee of the Liverpool Corporation on the 8th of January, the Gas Examiner (Mr. C. R. Bellamy) was instructed to consult with Professor Campbell Brown, of the University College, Liverpool, and obtain such analyses as he might require relative to the supply of carburetted water gas to the south end of the city, and to report generally thereon. This he did at the meeting of the Committee on the 19th ult. The report was ordered to be printed, and was issued last Wednesday. It is as follows:—

The use of carburetted water gas for illuminating purposes was first practically applied about fifteen years ago in the United States, where its progress was relentlessly barred by every conceivable form of opposition, largely emanating from the coal-gas interest; the most notable instance of effective opposition being that of Massachusetts, where its manufacture was prohibited by statute for several years, but was ultimately legalized upon a petition signed by 223 physicians, which concluded with the statement, borne out by the accompanying evidence of a large number of the principal scientists and leading men of the day, that "it is no more dangerous to health and life than coal gas, and there is no just ground, as far as health and life are concerned, to prohibit its manufacture." At the present time, carburetted water gas forms nearly 80 per cent. of the total supply of the United States. Care is, however, taken to ascertain that fittings are sound under high pressure before gas is connected to any building; and considerable attention has been given to the subject of suitable burners for the effective combustion of the gas.

Its adoption upon a commercial scale in this country took place in 1891—primarily for the purpose of enriching coal gas in place of cannel, which had attained to almost prohibitive prices. Oil was then being generally introduced for the purpose; but it was found that water gas afforded means of combining production with enrichment, readily, and with most perfect control, both as to output and illuminating power. Thus the ordinary coal-gas supply could be added to and enriched to any desired extent; the latter being carried out at a cost of about one-third that of cannel, with the further advantage that the higher the illuminating power of the gas, within reasonable limits, the cheaper the cost per candle of enrichment became.

The first installation, which is the largest in this country, was that of The Gaslight and Coke Company, London, where plant capable of supplying 10 million cubic feet per day is in operation. Since 1891, the date of its introduction in London, it has been adopted in a large number of towns throughout the country, but has generally been supplied mixed with coal gas in proportions varying between 25 and 30 per cent.

In 1895, plant capable of supplying 3½ million cubic feet per day was put down at Garston by the Liverpool Gas Company, by whom a very important departure was made in connection with its use. Instead of using it in combination with, and for the enriching of, the coal gas, it was adopted merely as a supplemental supply, and was delivered to Garston and the south end of the town unmixed with coal gas.

The new gas being much denser than that produced from coal, burners of greater aperture are required for its combustion. With the burners generally in use, there was a decreased consumption at a higher pressure, resulting in a lowering of illuminating power, accentuated in time by a carbonaceous deposit in the aperture of the burners, which speedily reduced them to a condition of practical uselessness for lighting purposes.* This difficulty led to the very general complaints, which finally induced an organized inquiry into the whole subject by certain gentlemen in the Garston district, which led to a general objection being made to the constituents of the new gas.

The most deadly of gaseous poisons is carbonic oxide, which is contained in ordinary coal gas in proportions varying between 4 and 8 per cent., while in carburetted water gas, as supplied in Garston, it amounted to about 30 per cent.; and to this high proportion general exception was taken. Alarm was also created by certain cases of gas poisoning in the district, the following particulars of which have been kindly furnished by Superintendent Keighley, who has charge of the police:—

County Police Office, Widnes, Feb. 16, 1897.

Sir,—I am in receipt of your favour of the 13th inst., and in reply beg to inform you the following are reports which the Police at Garston have received.

1.—At 10 a.m., May 30, 1895, Joseph Boldsworth, Marine Engineer, who was at that time lodging at 59, St. Mary's Road, Garston, was found in bed unconscious from the effects of gas which had escaped from a defective pendant in room. He remained unconscious till 8 p.m. same day. Dr. Molyneux, of Garston, attended him. He recovered in about a week, and left Garston for Buenos Ayres.

2.—Jane Lewis, wife of Captain Lewis, of Mes Llydllanbedagoch, Anglesey, was found in an unconscious state in bed at 18, Seddon Road, Garston at 11 a.m., Sept. 24, 1896, and room full of gas. She died on Sept. 30, 1896, from gas poisoning.

3.—William Yarwood, 48, King Street, Garston, was found dead, lying on bedroom floor at that address at 7 a.m., Nov. 29, 1896, and the house full of gas which had escaped from a defective pipe under bedroom floor. *Post mortem* proved that Yarwood died from gas poisoning.

4.—Captain Thomas James was found gassed and unconscious in bed at the Garston Hotel at 8 a.m., Jan. 4, 1897. He remained unconscious for several hours, and recovered in a few days. The gas escaped from bracket in bedroom, valve of which had not been turned properly off.

During the last twelve months complaints have been made to the police about the strong smell of gas from the works.

C. R. Bellamy, Esq. (Signed) J. KEIGHLEY, Superintendent.

Strong representations were made to the Gas Company on the subject by the Urban District Council of Garston; and at a recent meeting of

* Accompanying the report is a plate of photographs of flames of burners before and after use with unmixed carburetted water gas. These burners were the best of their type for use with coal gas; but after a few months' use with the carburetted water gas they were removed from a residence in Sefton Park in the condition shown.

the Directors it was decided to mix the carburetted water gas in future with coal gas before supplying it to the district. This was promptly done, being evidenced by the analyses of two samples of gas taken into Garston just beyond the city boundary, on the 29th of January last, by Professor Campbell Brown, in accordance with the instructions of the Committee already quoted. The result of Professor Campbell Brown's investigation is contained in the following communication, viz. :—

University College, Chemical Laboratories, Liverpool, Feb. 4, 1897.

On the 28th of January I received instructions, first, to make analyses of gas supplied from Garston to determine its constituents, and, second, to express my opinion as to the desirability of carburetted water gas, as now supplied at Garston, for the general purposes of domestic use.

First.—On the following day, 29th January, two samples were taken from two houses situated in Aigburth Road. The sample (1) taken at the point farthest from Garston was coal gas, and the sample (2) taken near the south end of Aigburth Road was a mixture of coal gas with carburetted water gas. The composition of the two was as follows:—

	(1)		(2)
Carbon dioxide	0·60	..	0·50
Heavy hydrocarbons	5·85	..	8·24
Oxygen	0·65	..	0·60
Carbonic oxide	6·76	..	19·14
Methane	35·93	..	20·45
Hydrogen	47·44	..	42·47
Nitrogen and loss (by difference)	2·77	..	2·79
	100·00		100·00

The constituents of the two samples are the same, but in different proportions. If I had an opportunity of determining the composition of the particular quality of carburetted water gas employed, it would be possible to calculate the proportion in which it is mixed with the coal gas in No. 2.

Second.—In order to form an opinion on the suitability of carburetted water gas for the general purposes of domestic use, certain data would be necessary, which have never yet been published, so far as I am aware; and some experiments would have to be made extending over several continuous days on the products of combustion in suitable burners and under ordinary conditions for (*a*) lighting and (*b*) heating purposes.

I have commenced the collection of data and have made some of the necessary calculations, but further instructions received on 3rd February limit my work at present to the analysis of the two samples taken on 29th January.

Mere analyses of two substances, both of which are poisonous if inhaled, would not warrant the formation of an opinion on the matters submitted to me, much less a responsible expression of such an opinion.

I am therefore reporting the details of the two samples given above.

(Signed) J. CAMPBELL BROWN.

The Committee will probably consider it desirable to instruct Professor Campbell Brown to continue and complete his investigations in the matter.

Analysis No. 2 indicates that carburetted water gas and coal gas were in about equal proportions; and this is borne out by the following letter from Mr. King, the Gas Company's Engineer :—

Liverpool United Gaslight Company, Feb. 15, 1897.

Dear Sir,—In reply to your letter of the 13th inst., I beg to inform you that the Directors have not yet decided on any definite percentage of carburetted water gas to be mixed with the coal gas at Garston. I may say, however, that at present the proportion of the latter gas in the mixture is greater than that of the former; and I anticipate that this arrangement will always be maintained in the future.

(Signed) WILLIAM KING.

C. R. Bellamy, Esq.

The following is an analysis of the unmixed carburetted water gas supplied from Garston, made by Professor Crum Brown, of Edinburgh, in March, 1896, and may be taken as typical of the gas supplied prior to the middle of January last :—

Carbonic anhydride	0·20
Heavy hydrocarbons	11·70
Oxygen	0·10
Carbonic oxide	32·10
Methane	21·20
Hydrogen	28·80
Nitrogen	5·90
	100·00

Professor Crum Brown made this analysis in connection with his report to the Edinburgh and Leith Gas Commissioners, who were then considering the desirability of providing plant for the manufacture of the new gas. The data given are exhaustive, and the Professor's conclusions are as follows, which induced the Commissioners to adopt the process :—

In the case of leakage into rooms where people are already asleep, or where people are unaccustomed to the use of gas for lighting purposes, the danger is certainly greater with carburetted water gas than with common coal gas, as the proportion of carbonic oxide is about three times as great. In the case of a mixture containing carburetted water gas and coal gas, in the proportion of one volume of the former to two of the latter, the percentage of carbonic oxide would be about 17 or 18, as compared with 10 to 11 in pure coal gas. [This latter reference was to the 25-candle gas of Edinburgh.] Such cases of leakage are quite exceptional; and when they do occur, the amount of carbonic oxide in the air may become excessive, and the danger great, in a very short time, even in the case of common coal gas. So that the difference as between carburetted water gas and coal gas is small when compared with the total risk. . . . On the other hand, there are distinct advantages. From a chemical point of view, the process of making illuminating gas from water gas and oil is greatly superior to that of making it from coal. In the former case, great uniformity is possible, owing to the facility with which the operations can be controlled and adjusted. The process is also a very clean one, and free from many of the objectionable features of coal gas making.

The subject of gaseous poisoning has recently been occupying considerable attention, and has been most exhaustively dealt with by Dr. Haldane, in a report to the Secretary of State for the Home Department, "On the Causes of Death in Colliery Explosions and Underground Fires." Dealing with the effect of carbonic oxide on the human system, Dr. Haldane says :

The key to the peculiarly insidious action of carbon monoxide is afforded by the following two facts: (1) The affinity of carbon monoxide for hæmoglobin is a very powerful one, so that even when a very small percentage of it is present in the air, absorption by the blood may go on steadily, though slowly, until finally the oxygen-carrying power of the hæmoglobin is reduced to a dangerous extent. (2) The symptoms produced by deficiency in the oxygen supply to the tissues are very slight up to the point at which there is loss of power over the limbs. When the limbs completely fail, it is, of course, impossible for a man to get out of the poisonous atmosphere. The affinity of carbon monoxide for hæmoglobin is about 250 times as great as that of oxygen. In other words, the hæmoglobin of blood brought into contact with air containing about 0·1 per cent. of carbon monoxide will finally become about equally saturated with carbon monoxide and oxygen. If the same blood be afterwards brought into contact with pure air, constantly renewed, the carbon monoxide is gradually driven out. This process of driving out occurs about five times as fast in pure oxygen. . . . When the blood of the living body has become about 50 per cent. saturated with carbon monoxide, there is loss of power over the legs. These facts make it possible to understand the process of gradual poisoning, or of recovery in fresh air. With less than 0·1 per cent. of gas in the air, the blood does not become more than 50 per cent. saturated, so that even a prolonged exposure does not cause complete helplessness. With 0·2 per cent. the blood will become about 67 per cent. saturated, and complete helplessness, with loss of consciousness, would doubtless occur. Probably this percentage would finally cause death, from the gradual damage produced by the diminished supply of oxygen to the tissues. 0·30 per cent. would certainly cause death in time. . . . Very little actual distress accompanies the action of carbon monoxide. After paralysis of the limbs, the senses are gradually more and more benumbed as by a gentle anæsthetic. If the percentage of carbon monoxide is large (more than 1 or 2 per cent.), loss of consciousness is followed by convulsions, &c., as in suffocation from rapid deprivation of oxygen. If there is less than 1 per cent. of carbon monoxide, death is very gradual and peaceful.

The figures here given supply valuable data upon which some useful calculations may be based. It must be borne in mind that carburetted water gas has an odour quite as strong as that of coal gas, and therefore can be as readily detected. Dr. Haldane's figures indicate that, with less than 0·1 per cent. of carbonic oxide in the air, there is no immediate danger. This would mean that the gas at present made at Garston, containing 19 per cent. of carbonic oxide, would have to escape in a small room—say, 10 ft. by 10 ft. by 9 ft.—from an ordinary burner passing 4 cubic feet per hour for more than an hour before the initial point of danger was reached, and this on the assumption that there was no exchange of atmosphere in the room by ventilation. The improbability of such a thing occurring, except by gross carelessness or accident of an unusual character, can best be demonstrated by allowing the gas to escape in an ordinary room from one burner for one minute, when the effect will show that, with the amount of gas given off, no one could reasonably disregard the warning. Taking the more likely case, though very unusual, of gas turned down in a bedroom (say) to a consumption of ½ cubic foot per hour, being extinguished by the action of the meter or the accumulation of water in the fittings, and subsequently escaping, it is clear that the leakage might go on for a period of over eight hours without serious risk; or with bye-passes on incandescent burners, which are occasionally subject to sudden extinction, the effect would be inconsiderable, as they are rated at about ¼ cubic foot per hour.

One other cause of sudden and excessive escape is associated with water-slide chandeliers (which accounted for the death of two ladies at Bath recently). Care should be taken to see that the outer tube is filled with water with a spoonful of oil on the top, to prevent evaporation, when the chandelier is pushed right up; and also that the chains are not long enough to permit of the inner pipe becoming unsealed in the event of one of the weights breaking loose and the chandelier falling to its lowest limit. This may be tested, after filling the chandelier, by pulling it very slowly down to the full extent, when if there is any bubbling of gas through the water the chains should be shortened. A further fruitful source of escape is in houses where lead pipes are embedded in the plaster of the walls and nails are inadvertently driven into them. With care in these directions, the risk of dangerous escape will be largely reduced.

For the purpose of ascertaining the comparative soundness of gas fittings in ordinary dwelling-houses in Liverpool, tests have been made in 23 cases spread over the city, with the result that in no instance would the fittings have passed the test applied in America. The highest leakage found, which was exceptional, was in an ironmonger's establishment combined with a dwelling-house, where it amounted to 2⅓ cubic feet per hour (the aggregate probably of a number of small leakages), and the lowest in a dwelling-house of about ten apartments, where the loss was only 0·024 foot per hour. The tests, however, indicate that it would be well for consumers of gas generally, whether manufactured from coal or otherwise, to periodically test their fittings by the ready means at hand of turning the gas off at all the small taps and leaving it on at the main, and noticing whether any gas is passing through the meter by the indication of the small testing dial or drum which is attached to the index of every meter.

For the purpose of ascertaining the comparative mortality due to the use of gas before and since the introduction of carburetted water gas, the Registrar-General's returns for England have been examined for 1890 and 1894 (the latter being the last available), and the figures are 7 and 14 respectively; while all the indications tend to show an increasing number in 1895 and 1896. These figures, however, prove the comparative safety of gas as a means of artificial illumination, since the deaths due to the use of oil-lamps for the years mentioned were 95 and 143 respectively—the more so in view of the fact that between the two years mentioned there has been a great increase in the number of gas consumers, with a corresponding decrease in the users of oil-lamps, due to the introduction of penny-in-the-slot meters.

The question has been raised from time to time as to the right of the Gas Company to manufacture carburetted water gas. There can, however, be little doubt on this point, seeing that section 1 of the Gas Company's Act of 1848 provides for the manufacture of gas "from coal or *other material*." The question as to the policy of introducing carburetted water gas in Liverpool is a complex one. It has been proved to be of great advantage, from the economic point of view, in crowded centres, where costly extensions of gas plant would have been necessary, due to the growth of the district. Thus in Belfast it was stated at a recent meeting of the Corporation that an expenditure of £15,000 on water-gas plant obviated an expenditure of £500,000 on ordinary coal-gas plant.

Professor Lewes, of London, has stated :

Where a 16 to 20 candle gas is to be supplied, the process would become far more valuable, as it would enable the engineer to make a certain proportion of his output of 22 and 24 candle gas, and to use it as an enricher

for the remaining coal gas, which could be made without employing cannel. Used in this way, also, it would be a great relief to those works which are under the necessity of keeping the sulphur compounds below 20 grains, as this gas contains hardly any sulphur compounds other than sulphuretted hydrogen; and an admixture of it with ordinary coal gas would bring these compounds well within the limit without extra purification.

The first advantage may not apply in the case of Liverpool, where there is plenty of land available near to the principal manufacturing stations of the Company; but the advantages pointed out by Professor Lewes appear to apply with great force, though its use in this way has not yet been dealt with by the Company. Pending this, it does not seem that any advantage to the consumer has followed the introduction of the new gas in Liverpool, as the present price of 2s. 9d. per 1000 cubic feet is 1d. per 1000 feet higher than during the normal period between 1885 and 1891, when coal gas alone, of the same illuminating power as at present, was supplied.

To ascertain the commercial and general effect of the introduction of this gas, on the same system as in Liverpool, in other towns of this country, the following queries were sent out to eight of the principal centres:—

1.—Are you sending out carburetted water gas mixed or unmixed with coal gas?
2.—If mixed, in what proportion?
3.—Have you experienced any difficulty in the combustion of the gas with the ordinary burners?
4.—Have you had any complaints from your consumers as to the hygienic effects of the new gas you are supplying?
5.—Has the effect of the introduction of the carburetted water gas been to cheapen the general gas supply to the consumers, and, if so, are you able to estimate the saving to them per 1000 cubic feet supplied?

The replies, which are interesting, are appended. They show that in every case the water gas is mixed with coal gas; the lowest proportion being 17 per cent., and the highest 50 per cent.—the average of all being 33 per cent.

It is stated that no difficulties have been experienced in connection with the combustion of this mixture; and in seven cases out of the eight no complaints have been received from consumers, and very few in the remaining one. In four cases, the price of gas has been reduced; in three others, it is contemplated; and the illuminating power has been increased in the remaining one. Thus it appears that the consumers in each case have benefited, or are likely to benefit, by the change, so far as the price of gas is concerned.

Complaints of low illuminating power of the gas supply to the south end of the city have no foundation in fact, as the standard has been well maintained by the Company throughout the city; the poor light being entirely due to the choking and unsuitability of the burners. A further complaint has been made that the gas is not so effective for heating purposes; but Professor Crum Brown has shown that, with gas of equal illuminating power, the loss is not more than 10 per cent., which is largely compensated for by a lower consumption of oxygen, and a consequently reduced vitiation of the atmosphere when used for illuminating.

Taking all the circumstances into consideration, there does not at present appear sufficient reason for objecting to the introduction of carburetted water gas, assuming that it is supplied in admixture with coal gas in the proportion of about 25 per cent., that it can be supplied at a cheaper rate than coal gas, and that due care is taken in using it. But it is very important that the admixture should be definite and general throughout the city, so that burners suited to the mixture may be adopted; one of the great difficulties of the present position being that burners suitable for the coal gas at the north end of the city are wholly unsuited for the mixed gas at the south end.

Appendix.

Appended to the report is a table giving the replies to the five questions stated above as having been addressed to suppliers of carburetted water gas in eight different towns throughout the country.

Question 1.—Are you sending out carburetted water gas mixed or unmixed with coal gas? Replies (in all cases), mixed.

Question 2.—If mixed, in what proportion? Replies: 1. Varies according to circumstances. 2. From 25 to 30 per cent.; have delivered over 50 per cent. 3. 17 per cent. last half year. 4. 30 per cent. 5. 33 to 50 per cent. 6. 25 to 50 per cent. 7. 45 to 50 per cent. 8. 25 to 30 per cent.; have gone to 50 per cent.

Question 3.—Have you experienced any difficulty in the combustion of the gas with the ordinary burners? Replies: 1. No. 2. No. 3. No; it assists the combustion. 4. No. 5. No. 6. No; only an improved light. 7. No. 8. Ordinary burners have answered up to the present; but as the percentage of water gas increases, the size of the burner certainly needs augmenting to develop power.

Question 4.—Have you had any complaints from your consumers as to the hygienic effects of the new gas you are supplying? Replies: 1. No. 2. Very few. 3. No. 4. No. 5. No. 6. No; on the contrary, the illuminating power having been increased, there is general satisfaction. 7. No. 8. No.

Question 5.—Has the effect of the introduction of carburetted water gas been to cheapen the general gas supply to the consumers; and, if so, are you able to estimate the saving to them per 1000 cubic feet supplied? Replies: 1. Further experience is required before answering this, but may say we are quite satisfied with the new gas. 2. The question of relative cost is a very complex one. Carburetted water gas is not in itself cheaper; but by economizing, or, as in our case, abolishing the use of cannel and utilizing a proportion of the coke produced from the coal gas, the cost of producing the latter is cheapened. There is also a reduction in the amount of coke produced; and, therefore, a chance of getting better prices. We have just reduced our price of gas 3d. per 1000 cubic feet, and undoubtedly this reduction has been the result of our production of carburetted water gas. 3. We reduced the price of gas by 2d. per 1000 cubic feet just before starting our water-gas plant. 4. The introduction of carburetted water gas has tended to considerably cheapen the general gas supply to consumers. 5. The effect of introduction of carburetted water gas has been to bring down price of cannel 50 per cent., which must react to the advantage of consumers. 6. No appreciable saving in manufacture, but the illuminating power increased. 7. Adoption of system enabled them to reduce the price 2d. per 1000 cubic feet. 8. Not been running sufficiently long to secure comparison of accounts, though it is hoped the addition will assist us in reducing expenses.

At the meeting of the Garston District Council last Tuesday, the Clerk (Mr. P. F. Gannett) read a letter from the Liverpool Gas Company acknowledging the receipt of a letter from the Council, requesting the Company to guarantee that in future at least 75 per cent. of coal gas should be supplied to the Garston district. Mr. J. Rigby thought the Company were treating them with scant courtesy in giving no reply to their letter, but merely acknowledging its receipt. It did not appear to him to be a question that could be shelved in this fashion. He thought there were now three alternatives before them. To sit down and accept the situation, and allow the Company to do as they liked; to apply for a Government inquiry; or to take steps to supply the district with gas themselves. The latter seemed to him to be the best solution of the difficulty. He did not know whether the members were aware that since their last meeting there had been another case of almost fatal poisoning in the district by water gas. He was assured this was so by one of the medical gentlemen. After further discussion, it was decided to ask the Company whether they had considered the question put to them as to guaranteeing that they would not supply to the district less than 75 per cent. of coal gas.

WATER GAS MANUFACTURE AT STOCKPORT.

The Local Government Board Refuse to Sanction a Loan.

The Stockport Town Council are in a rather peculiar position in regard to a plant which they are putting down for the manufacture of water gas, and which was the subject of an interesting, and at times somewhat animated, debate at the meeting of the members last Wednesday.

Mr. G. Burrows opened the discussion, by drawing attention to the fact that, a few weeks ago, the Local Government Board refused an application by the Council for sanction to a loan of £6227 for the manufacture of water gas. He asked if, in defiance of this refusal, the Committee had not spent all or a portion of the money; and, if so, where it had come from? Mr. Burrows went on to refer at length to the dangers of water gas, and quoted from the recent address of Mr. R. Porter to the Manchester District Institution of Gas Engineers, to show that water gas cost 6d. per 1000 cubic feet more than coal gas, and that the advantages did not compensate for this excess of cost. There was, he contended, no authority for manufacturing water gas; and any fatal case attributed to water gas would place gas companies in a serious dilemma. He also referred to the agitation at Liverpool and Birkenhead, and then read the following extract from a letter which the Town Clerk had received from the Local Government Board in regard to the loan: "As regards the sum excluded, I am to state that the Board understand that carbon monoxide, one of the constituents of 'water gas,' is of a highly poisonous nature, and that, although the Town Council would appear from the report to contemplate an admixture of coal gas with the water gas, the Board are of opinion that, having regard to the danger which would arise from the escape of the gas when a certain percentage of carbon monoxide is exceeded, and to the fact that the Board are not, as regards this percentage empowered to impose any conditions which they could effectively enforce, it is desirable that the Town Council, if their proposal to manufacture and supply carburetted water gas is to be carried out, should obtain the sanction of Parliament to their proposal by means of a Local Act, which should contain such provision as Parliament may think necessary for preventing danger to life." In face of this letter, Mr. Burrows thought the Committee would be very foolish indeed if they continued to take upon themselves the serious responsibility which must ensue from the manufacture of this gas, because it threatened the existence not only of the lives of the people who worked in their gas yarn rooms, but it threatened this very important industry itself. He considered they should have a local inquiry calling together the manufacturers of gas yarn, and asking for an opinion from them respecting the health of the workpeople and the probable extinction of their trade.

Mr. Hyde Marriott said he was one of those who supported the introduction of water gas. He had that morning been through one of the gas yarn rooms himself to see whether there was much inconvenience caused by this gas; and he had found that it was causing a considerable degree of alarm in the minds of the proprietor and the workpeople. It seemed to him, however, that it was more alarm than real danger; and for this reason. There must be a considerable escape of gas in the best of circumstances, not only from the small jets being blown out, but from the standards being continually moved from side to side, and causing a very considerable leakage from the joints; but the danger was minimized by the fact that the gas supplied to these mills was very largely mixed with atmospheric air, so that only a small non-luminant blue flame was produced. He certainly thought that in these gassing rooms, the escape of gas did injuriously affect the men working in the room—in fact, those he saw were far from being in a healthy condition; but he did not think the introduction of this small portion of carburetted water gas would have any appreciable effect. The only way to see how much of the carbonic oxide got into the atmosphere of these rooms, was by having it analyzed by an expert chemist. Then if the analysis proved that the atmosphere contained more of this gas than it should do, he believed they would all agree that water gas should not be used. Dr. Haldane, a recognized authority, had stated that a proportion of 1 in 5000 was not injurious in any way; and if they could show that there was less than this proportion in the atmosphere, they would be able to tell both masters and workpeople that they had nothing whatever to fear. Not only that, but in the introduction of this gas, there was added a constituent with such a powerful smell that a proportion of 1 in 50,000 was appreciable in the atmosphere; and a proportion of 1 in 25,000 would be absolutely disagreeable. In the interests of this trade, which was among their largest gas consumers, he thought they ought to show they were not trying to injure the trade or the workpeople; and he did not think such an inquiry would be a great expense.

Mr. Hidderley thought members ought to be very careful in making statements in the Council as to the danger of people being poisoned by water gas. It especially affected those who used cooking-stoves; and

there was no doubt there were many who would discontinue to use them through fear.

Mr. Webb, in reply to Mr. Burrows, said he could assure him that all the money borrowed would be applied for the purposes specified. As for the £6227, the sanction to borrow which had been refused by the Local Government Board, part of it had already been spent. They would have to pay for it as the Committee thought best. They had a reserve fund—about £4000—and this would wipe off the larger portion of it. The rest would have to be paid out of revenue. Carburetted water gas was no new thing in this country. For nine years, it had been supplied in London; and he certainly did not think they need be frightened at its introduction in Stockport. He quoted from the Presidential Address of Mr. John Young to the Midland Association of Gas Managers, in which the fears of those who condemned the gas were ridiculed.

The subject then dropped.

WATER-GAS PLANT PROPOSED FOR ROTHERHAM.

At the Meeting last Wednesday of the Rotherham Town Council, a Sub-Committee of the Gas Committee who had been appointed to consider the extension of the gas-works presented the following report: "Having visited several works last year where carburetted water gas is manufactured and in operation—including the Birmingham Gas-Works on Thursday, the 18th ult.—we are of opinion that a plant should be erected at the gas-works for making gas by a similar process; and that tenders should be advertised for a plant capable of producing 500,000 cubic feet of carburetted water gas in 24 hours, with necessary engine and boiler power, but so that the plant can be readily extended to 1,000,000 feet daily." The Gas Committee recommended that a Sub-Committee should be appointed to visit Liverpool, "to inquire into and report upon the use of carburetted water gas in that neighbourhood." As it appeared that the Gas Committee as a body had not had an opportunity of considering the report, it was (after some discussion) agreed to add to the recommendation a statement to the effect that the Council did not adopt the report of the Sub-Committee at present.

Mr. Gummer thought it should be stated that the Sub-Committee had come to the conclusion that it was absolutely necessary for additional plant to be put down at the gas-works. As Chairman of the Gas Committee, he wished distinctly to make it public that those who were responsible for the gas department, and for keeping the town illuminated, would not accept any responsibility unless the Council determined to add to the present plant. During the past three years the number of consumers had increased by 3316; and the daily make of gas, by 203,000 cubic feet. The maximum make of gas at the works was 1 million cubic feet; but the maximum consumption one day last year had reached 1¼ millions. He thought it was time the Corporation took the matter more seriously into consideration. When the Committee entered into the subject, they thought a carburetted water-gas plant a likely means of auxiliary supply. He spoke of the visits of the Sub-Committee to different plants in various parts of the country, and of their unanimous decision; and yet they were now told their recommendations could not be adopted until a deputation went to Liverpool. He personally had no objection to the deputation; but unless the Committee could take the matter in hand, so that they could put down additional plant to increase the production of gas by half a million cubic feet, he did not think Mr. Murdock or anybody connected with the gas-works, or anyone who took an interest in the gas-works, would like to accept the responsibility. If anything should happen during the next winter, they would immediately turn round and blame the Chairman of the Committee and the officers of the department. At the present time the defective illumination was not due to the quality of the gas, but to the Manager having to reduce the pressure to keep up the supply at all. If there was a severe fog, the Manager had told him he could not be responsible for the town being put into darkness. He mentioned this in order that the Council might understand they had taken a matter in hand which would have to be grappled with at once. It appeared, he said, that some members of the Council had a doubt in their minds as to the effect of carburetted water gas on the health of the people. He thought, however, it was an anomaly to send a deputation to Liverpool; and that a great deal more had been made of the subject than was necessary. The objection had never been raised at Birmingham; and part of the Committee had visited fifteen or sixteen towns before. As compared with these, the plants at Liverpool and Birkenhead were small. It did seem inconsistent, after the Sub-Committee had been appointed to report, and had reported, that their report should be objected to, and another, and smaller, Sub-Committee should be appointed to make inquiries on the same subject. He would oppose the appointment of the Sub-Committee to go to Liverpool.

Mr. Winter thought the Council were prepared to accept the responsibility of delaying the matter for a month. The reason they had refused to adopt the report of the Sub-Committee was that they had good grounds in the reports of the Liverpool papers for thinking that a number of deaths there had been traceable, or were entirely due, to the use of carburetted water gas. He mentioned that at Garston there had been no less than three deaths in nine months. Why should the Chairman of the Gas Committee seek to throw the responsibility on the Council of putting the town in darkness, simply because they refused to act with him in this scheme? If the health of the town was going to suffer, it was desirable that they should have every possible information.

The Mayor regarded the statement of Mr. Gummer as a very important one. Those who opposed the adoption of the report of the Sub-Committee had spoken as if those who were in favour of it had less consideration for the health of the town. But he would point out their inconsistency. They were appointing a smaller deputation to go to Liverpool; and when the Council refused to adopt the report of ten gentlemen, was it likely they would adopt the report of the three or four who went to Liverpool? Even if they came back with a favourable report, was there the slightest guarantee that it would be passed? He thought the Council were taking a serious responsibility on their shoulders.

Mr. Robinson said he was actuated by a desire to do right to the inhabitants, and had no wish to endanger their lives by something which no member of the Council could say there was not danger attached to. They had evidence that deaths had been traceable to this danger, whether from carelessness of the officials or others, he could not say. But there was the fact; and they had a perfect right to satisfy themselves on the point.

The discussion was prolonged, in the course of which Mr. Mason wished to reply to the Mayor's charge of inconsistency; but the Mayor refused to allow him to speak again.

Mr. Gummer replied at length to the discussion; rebutting the idea that carburetted water gas was dangerous to health, and mentioning that it was proposed to mix it with coal gas before consumption.

The recommendation of the Committee that the Sub-Committee visit Liverpool was eventually passed.

THE GAS SUPPLY OF LIVERPOOL.

Differential Prices for Prepayment Supplies—The Retail Price of Coke.

At the Monthly Meeting of the Liverpool City Council last Wednesday, the following notice of motion was on the *agenda* paper; but so little interest did the debate on the subject provoke that the Council was counted out, as a quorum was not kept: "That the Lighting Committee be instructed to enter into negotiation with the Liverpool United Gaslight Company, with the object of obtaining from the Company a reduction in the price of gas to consumers in the city who have adopted the automatic 'penny-in-the-slot' system, and who now pay in advance 7d. per 1000 cubic feet more than the ordinary quarterly consumer pays after supply. And, further, to try and obtain for the citizens greater facilities for purchasing coke at the same price as the Company receive by sending that fuel out of Liverpool."

Mr. W. Denton, in whose name the motion stood, said that prepayment meters were used by a class of consumers in the city exceeding 13,000 in number; and the price of gas supplied to them was regulated when the charge to the ordinary consumers stood at 3s. 4d. per 1000 cubic feet. It seemed to him a great anomaly that these consumers should be called upon to pay 7d. per 1000 feet more than the other class of the Company's customers. If the meters could not be re-adjusted, a rebate should in all justice be allowed to users of penny-in-the-slot meters. As to the other question, he thought that Liverpool people, especially the poor people, should be able to buy coke at the different depôts at the same price as the Company obtained by sending it out of Liverpool.

Mr. Lister (a Director of the Company) said there were 13,000 automatic meters at work; and the consumers who used them were not only supplied with a meter free, but were furnished gratis with a gas pendant and a small stove for boiling. These appliances and the tubing necessary were not only supplied, but kept in order. The cost to the Company was about £1 4s. 8d. a year, and the amount received for the gas burned was about £1 6s. 8d., leaving a profit of about 2s. a year, which was certainly only a reasonable return for the advantages afforded. Referring to the coke supply, he said that, of course, large consumers like the London and North-Western Railway Company, who took 30,000 tons per annum, got their coke for less. As regarded smaller consumers, who were not contractors, it was the business of the Company to get the best price for their product, in order to as far as possible reduce the price of gas.

Mr. W. Oulton also opposed the motion. The Council, he said, were being asked to undertake an objectionable business. Interference was inadvisable, since they could not regulate the prices charged by the Company.

Alderman F. Smith remarked that the Company had been allowed to get into a position of supremacy, and could place their heel on consumers and the Council in a manner which was discreditable to those who had allowed such a state of things to arise. Mr. Oulton, as representing a working-class constituency, ought certainly to know that, owing to the policy of the Gas Company, the great majority of poor people were debarred from using either gas or coke.

Mr. Oulton was sure Alderman Smith did not wish to misrepresent him. What he desired to point out was that the motion invited the Council to interfere in order to attempt to regulate the prices charged by the Gas Company.

Alderman Smith asked whether Mr. Oulton did not appreciate the force of public opinion. He had seen Mr. Oulton, and the Gas Company, too, "squirm" before public opinion. ("Oh," and laughter.) Had the Company not "toed the line" with regard to water gas? (Laughter.)

Mr. Lawrence protested against these remarks as out of order.

The Lord Mayor said it was not a question of the Gas Company toeing the line, but of a communication to the Company.

Alderman Smith said it was a question, it seemed to him, as to whether the Council were going to lend their great weight, or the weight they ought to have, in favour of working-class consumers, their constituents, or whether, as had too often happened, they were going to show themselves powerful friends of the gas monopoly. Alderman Smith was proceeding to speak on the general question of the gas supply, when attention was called to the fact that there was no quorum present.

The meeting accordingly came to a somewhat abrupt termination.

Incandescent Gas Lighting at Hampton Wick and Teddington.—The Engineer of the Hampton Court Gas Company (Mr. W. E. Price, Assoc.M.Inst.C.E.) has lately completed the installations of incandescent gas-lights, in the streets of Hampton Wick and Teddington, in accordance with the decision come to by the Local Authorities towards the close of last year. There are about 360 burners in use.

Extension of the Larne Water-Works.—Yesterday week the ceremony of cutting the first sod of a new storage reservoir for Larne, which is being constructed at an estimated cost of £5000, was performed, in the presence of the Commissioners and a number of the townspeople, by Mr. David M'Quillan, the Chairman of the Town Commissioners. In a short speech, this gentleman stated that the reservoir would have a capacity of 9½ million gallons, and be capable of holding sufficient for a three months' supply. They had been granted the necessary loan for the purpose by the Board of Public Works; and the Contractors (Messrs. Heggarty and Gault) were ready to commence their operations. The Contractors presented Mr. M'Quillan with a handsome silver spade, with bog-oak handle; and with this the first sod was turned amid cheers.

BIRMINGHAM GAS-WORKS PROFITS AND THE IMPROVEMENT RATE.

In considering the rate estimates for the year to March 31, 1898, at their meeting last Tuesday, the Birmingham City Council discussed the possibility of obtaining a further contribution from the revenues of the Gas Department.

Alderman CLAYTON, in proposing the approval of the estimate for the improvement rate for the year, said that the estimated expenditure was £203,584; but certain deductions and additions (which he specified) had to be made. After these modifications, the total amount required was £199,868; and if they levied a rate of 2s. 3d. in the pound, this, the Finance Committee calculated, would produce practically the amount. They expected £5000 additional this year from the Gas Department.

Mr. LANE moved, as an amendment, that the estimate be reduced by £7400—the estimated produce of a penny rate—and that the deficiency be met by a further contribution from the Gas Department. He said they had waited twenty-four years for the fulfilment of an assurance given them in March, 1874, by Mr. Joseph Chamberlain, at the time the Gas Department was taken over, that there would be £70,000 forthcoming in aid of the rates. He considered Mr. Chamberlain a true prophet; for they saw sufficient from the accounts of the Gas Committee to warrant the distribution he suggested. Although during the last twenty-four years, the producing power of the gas-works had been practically doubled, the capital account stood at the same figure—about 2 millions—showing that capital expenditure had been paid for out of revenue.

Mr. HOLLOWAY seconded the amendment.

Alderman POLLACK said the additional £5000 to be given from the profits of the Gas Department was only a prospective estimate; and when the Gas Committee's report was presented, the amount to be assigned to the rates would have to be decided by the Council. The transfer of the undertaking to the Corporation took place in 1875, and not twenty-four years ago; and Mr. Chamberlain did not speak of £70,000, but £50,000, as being forthcoming in aid of the rates. Mr. Chamberlain stated, at the time of the transfer, that the capital was 2 millions; and it was reasonable to expect that, with the increases that would take place, the capital would at present be about 3 millions, and the difference in the interest—which between the old Companies and the Corporation would represent fairly 1½ to 2 per cent.—should accrue to the rates. With the extra £5000 to be given to the rates, the contribution of the Gas Committee was practically £50,000—£30,000 was given directly to the rates, £4000 was the interest on the reserve fund, and £15,000 was the contribution of the department to the public lighting of the city and neighbourhood. The policy of the department had been the most beneficial policy to the ratepayers at large. He thought the Chairman of the Finance Committee would support him in saying that it would not be to the advantage of the Corporation that the profits of the department should be made the stopgap of financial deficiencies. The revenue might be very good some years; but it was by no means certain, as it depended entirely on the price of coal and the sales of the residuals. It must be remembered, too, that the value of the annuities had been estimated at twenty-five years' purchase, whereas they were worth from thirty-five to thirty-seven years' purchase; and the difference alone in this valuation was about £4000 to £5000. Moreover, in times of prosperity, the gas consumers would expect some consideration. The Council should not look on the department as a reserve fund. There were a vast number of undertakings in the city, the cost and expense of which were uncertain; and it was for the benefit of the town that they should have, in the Gas Department, at least, an undertaking which was perfectly sound, able to pay its own interest, and a moderate contribution to the rates. He hoped that the amendment would not be accepted.

Mr. LANCASTER said they discussed this question ten years ago, and were then promised that, if the value of coke increased, they should have a greater contribution from the Gas Department. In 1887, the amount received from coke was £34,000; and the profit on the undertaking was £19,000. The figures increased till in 1890 the sales of coke realized £60,000; and the profit amounted to £70,000. The very next year coke went up by £31,000; and the profit on the undertaking went down by £36,000. He thought a decrease in the price of gas was not called for at the present moment; but if they could take a penny off the rates, the benefit would be felt by small shopkeepers who were heavily rated.

Mr. HENNESSY, supporting the amendment, urged that Mr. Chamberlain's speech was based on the calculation that, if the consumption of gas increased at the rate of 10 per cent., there would be a reduction in the rates to the extent of £70,000 per annum. The price of gas had not in any way diminished; and they found the appalling fact that, while the consumption had increased, with no advance in the price of labour, the profits from gas especially had diminished from £50,000 in 1882 to £25,000 last year.

Mr. BISSEKER thought the suggested proceedings were very strange. It was really pledging a dividend before the books were made up; and he did not think any company would take such a step.

Alderman JOHNSON urged that the Council might dismiss as totally irrelevant to the matter what Mr. Chamberlain said or did not say, or whether his prophecy was correct or not. The Council had a simple point to consider. Personally, he thought the action suggested was wrong in principle. As Mr. Bisseker had said, they had not the profit account made up yet; and they did know what the Gas Committee would be able to contribute. If they established the principle that the Gas Committee was a sort of till that any Committee could get their hands into in the event of a deficiency, they would be doing a very dangerous thing. It was utterly wrong from a commercial point of view, and as a matter of precedent.

Mr. HUNT supported the amendment; observing that, if the profit of the Gas Committee for the past year was not better than for 1894-95, then there had been some very bad management.

Mr. BISHOP challenged Mr. Hennessy's statement that the Gas Committee had not paid any increased wages, affirming that an additional outlay of more than £34,000 had been entailed by the increased labour and the granting of holidays to the workpeople. Regarding the figures quoted by Mr. Lancaster as to the increased sales of coke, he pointed out that the vital question was the comparative profit realized on the sales. As business men, the Committee took an especial pride in the fact that the capital of the department was only about the same now as when the undertaking was acquired, inasmuch as they knew the great bane of many commercial enterprises was over-capitalization. It appeared to him that the representatives of the Ratepayers' Association were trying to bolster up and repair their lost popularity by trying to filch some of the profits of the Gas Department.

Mr. LANE protested against this expression.

Mr. BISHOP said he would withdraw the word "filch," as he did not intend to impute any personal designs.

Mr. JARVIS declared Mr. Lane was actuated by the highest motives.

Mr. STEVENS opposed the amendment, and said that, as Mr. Lane posed as the friend of the working classes, he should like him to note that, if any relief was to be given, it was preferable it should be as a reduction in the price of gas. Moreover, the Gas Committee had now before them a demand for concessions to their workmen, to concede half of which would involve a cost of £10,000 per annum. He was quite certain the Committee would have as much genuine regard for the interests of the working-class ratepayers as Mr. Lane; and he thought this hunt for cheap notoriety had been carried too far.

Alderman CLAYTON, in replying on the discussion, made an unavailing appeal to Mr. Lane to withdraw his proposition.

The amendment was defeated by 44 votes to 14; and the original resolution was then adopted.

THE HOYLAKE DISTRICT COUNCIL AND THE GAS AND WATER COMPANY.

The Hoylake and West Kirby Gas and Water Company some time ago applied to the Board of Trade for a Provisional Order to sanction the raising of £10,000 more capital for the purposes of their undertaking. It does not appear that this proceeding was regarded in any hostile way by the consumers; but the occasion was taken by the District Council to raise certain objections. A conference was accordingly arranged by the Board of Trade; and it took place on the 16th ult., in the presence of Sir T. Blomefield, one of the Assistant Secretaries of the Board. The opponents, in the shape of a deputation from the Council, having stated their case, in which it seems that some suggestion was made as to the insertion of a compulsory purchase clause in the Order, they were politely informed by Sir Thomas that this could not be done. On this matter, therefore, the Company scored the first point. The original proposal included a provision for the purchase of certain land, at a cost of £1000, for the erection of a holder. The Company decided, however, not to make the purchase, but to put up the holder on land already in their possession. They therefore reduced the amount of the application to £9000, which was granted notwithstanding the opposition of the Council. The standard dividend upon money to be raised under the Order was fixed at 7 per cent. per annum, and not at 5 per cent. as proposed by the Council's representatives, who also asked for a reduction in the standard price of gas. The Board reserved their decision on this point; but two days after the conference they wrote that they had decided not to entertain the suggestion of the Council. The latter proposed that a limit should be placed upon the amount to be raised in any year under the provisions of the Order; but as this would seriously hamper the Company and retard necessary works, extensions, and improvements, the restriction was not authorized. The clauses referring to the consolidation of the various classes of shares, which, if granted, would not have conferred any privilege or increased value to the shareholders, and were promoted solely for convenience, were withdrawn on the suggestion of Sir T. Blomefield. Referring to the rate of interest to be paid on moneys raised under the borrowing powers of the Order, the usual limit of 5 per cent. was inserted in the draft. As, however, the highest rate the Company are now paying on any portion of their mortgage debt is 4 per cent. they agreed to the latter rate being fixed as the maximum applicable to the Order. The Company are to be congratulated on the success of their application.

SMETHWICK DISTRICT COUNCIL GAS SUPPLY.

The Annual Accounts.

The fifteenth annual statement of accounts in connection with the gas undertaking of the Smethwick District Council has just been issued by the Secretary (Mr. W. J. Sturges). It furnishes the following details: The borrowing powers of the Council in respect of the undertaking remains as at the close of 1895; but during the past year the Gas Committee applied to the Local Government Board for sanction to a further loan of £1500, to provide for the cost of a new purifying-shed and a carburetter, as well as to meet additional outlay on meters. The total loan indebtedness on Dec. 31, 1896, was £160,619—a reduction of £622 on the previous figures. In the course of the year, £1039 was spent in additions to the manufacturing and distributing plant. The total outlay on the gas undertaking has been £170,128, which exceeds by £747 the amount authorized to be borrowed. The capital expenditure per ton of coal carbonized works out to £8 16s., and to £827 9s. 1d. per million cubic feet of gas made. The marked development in the sales of gas in 1895, referred to in the report for that year, has been surpassed by the output during the twelve months lately ended—the increase being no less than 18,538,000 cubic feet, or at the rate of 10¼ per cent.; and the income from this source has exceeded the income for 1895 by £1530. With the exception of increases of 1,500,500 cubic feet of gas supplied through prepayment meters, and 411,100 cubic feet more used for the public lighting, the whole of this improvement is attributable to the large consumers. The number of meters in use on Dec. 31 was 2905—an increase for the year of 62 ordinary and 142 prepayment meters; bringing the number of the latter in service up to 413. The amount received from these meters during the year was £505 15s. 7d.; representing a consumption of 3,034,700 cubic feet of gas. The total income from residual products was £6274—an increase of only £36 over the previous year, notwithstanding that nearly 1000 tons more coal were carbonized.

This was the result of a decline in the value of coke; the falling prices of 1895 having dropped still further in 1896. The average amount received for the latter year was 1s. per ton lower than for 1895. There was a slight improvement in the quantity of gas made per ton of coal carbonized; and the percentage used for heating the retorts was the same as before—viz., 2·2 cwt. per ton of coal carbonized. The total income from all sources amounted to £30,839, as compared with £29,225 for 1895; being £1614 more. The total expenditure was £19,696; being an increase of £989. The manufacture of gas cost £15,530; being equal to 16s. 0·792d. per ton of coal carbonized, as compared with 16s. 2·826d. per ton in the previous year. Coals were cheaper; the average price being 11·161d. per ton lower than for 1895. Oil for enriching, which had been in use three months, cost £396. The bulk of coal carbonized was 19,333 tons, or 982 tons more than was required in the preceding year; the quantity of gas produced therefrom being 205,605,000 cubic feet, or an average of 10,635 cubic feet per ton. The yield for 1895 was 10,406 cubic feet per ton. There was a satisfactory diminution in the percentage of gas unaccounted for; the figure being 5·10 per cent., as compared with 7·57 per cent. for 1895. The gross profit for the year was £11,142; being £624 in excess of the amount earned in 1895. The net profit was £3117. This added to the balance brought forward—viz., £257—made a total of £3374. Out of this will be paid the contribution of £1200 arranged to be transferred to the district fund account; leaving £2174. Mr. Sturges recommends that £600 should be taken from the surplus profits to form a depreciation fund.

GAS AND ELECTRIC LIGHTING QUESTIONS AT BIRKDALE.

At last Tuesday's meeting of the Birkdale District Council, the Lighting Committee reported that they had had interviews with a Sub-Committee of the Southport Corporation, in regard to the supply of gas in bulk; but they could not recommend the Council to enter into any arrangements for taking gas in bulk at the price named. They, however, advised that the question of supplying the district with electric light should be considered, and the necessary steps be taken for the purpose. It was explained that the passing of the minutes did not bind the Council to the adoption of the electric light; but even then the councillors did not seem particularly eager to express their opinions. Those who did speak were in accord in thinking that the Council should not allow the supply of electricity to pass into the hands of a company. One member stated that he had met a gentleman who represented a company who were prepared to undertake the supply of electric light to Birkdale. They would furnish all the fittings and the wiring free; and the maximum cost of the light would be 6d. per unit, which was equal to 3s. 6d. per 1000 cubic feet of gas—the price they were now paying—and 4d. per unit for street lighting, which charge would also include cleaning. The minutes were passed.

The Law Clerk, later in the proceedings, read a report upon the negotiations between the Sub-Committee of the Council and the Southport Corporation, which stated that the latter wished the Council to adopt for testing purposes the 18-candle Sugg burner, for gas of an illuminating power of 17 candles; to consent to the abolition of the rebate; and to the payment of 4d. per 1000 cubic feet more than was charged in Southport, together with the abolition of the meter-rents. The Birkdale Council suggested that 3d. per 1000 feet more than was charged in Southport would be a fair price. He had received a letter from the Town Clerk (Mr. Williams), which stated that, as Birkdale had declined to consent to the revision of the section of the Southport Improvement Act, 1871, with reference to the question of rebate, the Gas Committee were not prepared to consider the limitation of prices as between Birkdale and Southport. It was understood that Birkdale would be excluded from the Provisional Order to be applied for, and that the district would be supplied by a separate main. In the course of the conversation which followed, Mr. Barrett asked if it was the case that the negotiations fell through because Southport wished Birkdale to give way in reference to the rebate. Mr. Kilvert said that was what was stated in the last letter. Mr. Barrett thought the *crux* of the whole matter was that the Corporation did not want to allow the Birkdale consumers any rebate. Mr. Hartley remarked that Southport would not do anything. They wanted to take everything and give nothing. Mr. Kilvert said they were prepared to take gas in bulk upon equitable terms, but not upon those suggested by Southport. The subject then dropped.

A NEW GASHOLDER FOR BIRMINGHAM.

The report of the Birmingham Corporation Gas Committee on the question of making provision for additional storage at the gas-works (as noticed in last Tuesday's issue) was introduced, by Alderman Pollack, at the meeting of the City Council the same day. He moved that the Committee be authorized to provide an additional gasholder and tank at Nechells, at an estimated cost of £72,000. He pointed out that the present total storage capacity was 26,500,000 cubic feet; while the maximum daily output was 30,199,000 feet. It was considered a sound principle that the storage capacity should be at least as large as the maximum daily output; but they were 3½ millions short of that standard, and the output was rapidly increasing. Even if 12 per cent. (the present abnormal rate of increase) were not maintained, there was little doubt that the average increase—viz., 3 or 4 per cent.—would be; and the new gasholder, which would take three years to build, would be ready just in time for their needs. The tank would be 40 feet in depth, the same as that adjoining; but the diameter would be 264 feet as compared with 200 feet in the case of the other holder at Nechells. If it were a three-lift holder, the capacity would be 6 millions; and the cost £60,000. But as to make it a four-lift holder, with a capacity of 8 millions, would only cost £12,000 more, the Committee would probably decide, on the grounds of economy, to adopt the latter plan; and this was why they had asked for power to spend £72,000. In reply to Mr. Lane, Alderman Pollack said that the manufacture of water gas, rapid as it was, did not make large storage capacity unnecessary, as the water gas only formed a small proportion of the output. All expenditure on works of this kind was charged to capital. The motion was adopted.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Saturday week, at the Offices, Willoughby Lane, Tottenham—Mr. Corbet Woodall, the Deputy-Chairman, presiding.

The Secretary (Mr. James Randall) read the advertisement calling the meeting; and the report and accounts, which were noticed in the "Journal" for the 23rd ult., were then presented.

The Chairman, before proceeding with the ordinary business, read a letter from Mr. G. Gripper (the Chairman of the Board), in which he regretted that an affection of the foot prevented him being present. Mr. Gripper (Mr. Woodall remarked) was with his colleagues a fortnight previously; and he continued to take the keenest possible interest in the affairs of the Company. In moving the adoption of the report and accounts, the Chairman said he did this with at least an average amount of satisfaction and pleasure. The statement for the half year was, on the face, a very satisfactory one; and, behind the face (if he might use such an expression), it was still more satisfactory. At the last meeting, he explained that they had altered the date at which the indices of the meters were taken by something like a week. It had been extended until it now encroached upon the following half year to an extent that threw a comparison of the June and Christmas half years very much out. They had altered this so that the indicing was commenced about a week before the end of the half year, and finished about a week after. Consequently their comparisons would in future be fairly made one against the other; but the result was that the apparent revenue of the two half years of 1896 had not been properly comparable with that of the two half years of 1895. That was to say, instead of the reading of the meters in January extending up to (say) the 15th, it was finished after the first few days of the month; while, under the old system, they would have had the remaining days up to the 15th bringing in revenue to the Christmas half year. One result of this was that, while the increase in the quantity of gas sent out during the past half year had reached, in comparison with the second half of 1895, the surprising percentage of 15, they had only brought to charge a little more than 11 per cent.—the difference being accounted for in the way he had explained. While this had robbed the past half year, it would bring an additional amount in to the current half year, which would consequently show exceptionally well. There were one or two other points in the accounts which called for notice; and, if his observations upon them were somewhat crude, he was sure that, under the circumstances, the proprietors would forgive him. Mr. Gripper had as usual prepared a careful analysis of the accounts; and, this being so, he (the Chairman) had not felt any obligation to do likewise. As most of the proprietors were aware, there had been something like a revolution introduced into the system of gas supply in Tottenham during the year 1896. They had supplied to the consumers something approaching 50 per cent. of gas made from the coke produced in the manufacture of coal gas, and enriched by oil. They introduced this carburetted water gas about two years ago; and so had been able to give it a thorough and complete trial. The satisfaction which they felt with it was shown by the fact that, after they had had the first plant at work for about twelve months, the Engineer (Mr. W. H. H. Broadberry) petitioned for permission to duplicate it; and the Directors assented. A house suitable for this extension was built at the outset; consequently they had now twice the amount of plant in use that they had this time last year. The effect of this was that they were no longer so much dependent, as regards the price at which they could sell gas, upon the price of coal. The price of oil (which came to them from Russia and America) was quite as important an element as the price of coal from Durham. The price of oil had been higher in the past half year than during 1895. But he was happy to say that, owing to the fact that oil producers and merchants had recognized that a great industry had arisen in England, and to a less extent on the Continent, the means of supply had been greatly improved; and there was every prospect that the price of oil would return to something like the level of 1895, if not lower. But even with the price as it was, they ascribed to the modification in their process the facility that they found they had for reducing the price of gas; and they were also satisfied the quality of the gas had shown a clear and marked improvement. Turning to the accounts, there were one or two items which called for notice. For instance, it would be observed that, in the item of salaries, there was an addition of £507, compared with the corresponding half of 1895. It would be remembered that, at the last meeting, the proprietors voted an increase in the salary of the Secretary; but this did not amount to the sum he had named. The explanation of it was that—recognizing the very great addition to Mr. Broadberry's labours that had been involved in the recent extensions of the works and mains, and the ungrudging devotion he had shown to the works—the Board had asked his acceptance of an honorarium, which was included in this item of salaries. Whatever he (the Chairman) might think of other items in the accounts, he felt quite sure of the concurrence of the proprietors in the action of the Directors in this matter. Perhaps he ought to have noticed earlier the fact that they had a considerable increase in the amount of their capital account. They could not have increases of 15 per cent. upon 10 per cent. going on year after year without having to spend large sums of money to supply the necessary means of meeting the demand. During the half year, they had spent £23,000 of additional capital; and as the proprietors were aware, the Directors were about to issue further capital in order to provide this money. They had a way which, they thought, had some points to recommend it, of spending their money first and raising it afterwards; and this capital was raised at a lower rate than the average of the capital with which they had hitherto worked. The Directors were satisfied that their increasing business would enable them to comfortably meet the charges due to the additional capital. There was a question the Directors had considered at their last two or three meetings which he was authorized to mention to the proprietors. It was this—that, under the conditions of the Company's Act of Parliament, the sliding-scale by which their dividends were governed authorized the Directors to pay the proprietors, at the present price of gas (3s. per 1000 cubic feet), dividends of 12 and 9 per cent. The Directors thought they had interpreted the feeling of the proprietors accurately in not being in haste to pay to the uttermost what they were entitled to do under the Act. But it did seem that the time had come when they might fairly consider

whether or not it was desirable to make the 11½ per cent. into 12 per cent., and the 8½ per cent. into 9 per cent.; and if the results of the current half year were as good as they confidently expected they would be, the proprietors might reasonably anticipate that the Directors would recommend that the alteration be made at the next half-yearly meeting. Regarding the capital expenditure, he was reminded by the Secretary that they had lately spent about £16,000 in laying new mains; and, in addition to the new carburetted water-gas apparatus, they had very largely extended the purifying plant. It would also be gratifying to the shareholders to know that they had now more than 5000 prepayment meters in use in the district. The increase in this particular had been as astonishing as anything he had ever known in connection with the gas business. The average sale per meter had been about 12,000 cubic feet per annum; and in January alone they received in coppers from these meters £800 all but 15s. The coin meters now numbered, within a few hundreds, as many as the ordinary ones.

Mr. J. Warren seconded the motion.

Mr. H. D. Ellis, having congratulated the Directors upon the admirable statement they had put before the proprietors, said there were one or two items which had particularly struck him. Perhaps one of the most extraordinary was the law charges, £1 11s. 6d. "Happy," he remarked, "was the country that had no history;" and happy was the company that had no law costs! Bad debts, too, amounted to the small sum of £53. He had roughly figured this out; and it only averaged 3s. 6d. per £100 of the rental, and some of it might still be recoverable. He thought this was very admirable; and it showed the collectors did their business remarkably well. He always found that, if there was an unsatisfactory item in the accounts, it was sure to be one which was wholly beyond the control of the Board. The one he happened to notice was rates and taxes, £2176; and he thought, subject to correction, this was very high. He had not made a careful calculation; but he believed it worked out to about 2½d. per 1000 cubic feet of gas sold. He used to think, and he thought so still, that 1½d. was quite enough for rates and taxes. In this case, in his opinion, they were nearly 50 per cent. higher than they should be; but the Directors could not help it. It was the way of the public authorities to cram as much as possible on the backs of gas companies. It was shortsighted policy, because it was the gas consumers who had to pay these rates and taxes; and therefore gas consumers were taxed to an undue extent. If he was right in believing this charge was ¾d. per 1000 feet too high, he was inclined to think, if it were at its proper figure, the Board would consider the possibility of reducing the price of gas by another 1d. Residual products were in a bad way indeed; but happily the system of water gas relieved them to a considerable degree of the loss they would otherwise suffer from the sale of coke. He heard, with satisfaction, the announcement with regard to the prospect of an increase in the dividend. He was no advocate of inflated dividends, or dividing up to the hilt. He advocated having substantial reserves; and nothing, in his opinion, strengthened the position of the Company's stock in the market so much as the knowledge that they had a good reserve at command. Their reserve amounted to nearly 10 per cent. of the paid-up capital, exclusive of loans; and so he thought the Directors would perhaps see their way to pay the extra dividend of which the Chairman had spoken.

The Chairman said the rates, while they were certainly not low, were lower than last year—they had paid less in the past half year than in the corresponding period of 1895. They had had notice of a rather considerable increase in the amount of the rates; and this the Directors were now dealing with. The rates, it was true, were high enough; but they were not quite so high as suggested. They amounted to rather under 2d. per 1000 cubic feet, which was just about the average of the Suburban Companies of London. As to the residuals, the price of tar had been fairly well maintained; but from month to month the cry with regard to sulphate of ammonia was "still lower." As to coke, Mr. Ellis had very properly explained that one advantage of undertaking the manufacture of carburetted water gas was that they created a very good consumer for their own coke; and, as a matter of fact, they would undoubtedly "ring the changes" of gas making between coal and oil. As the price of oil went up, they would diminish the quantity of water gas; and as the price of coal advanced, they would diminish the quantity of coal gas. Then, again, if the price of coke rose materially, this would exercise some influence. They were not bound so completely by only one set of circumstances to govern their procedure as they were before. They had two sources from which they might derive economy; if one failed, the other would be available.

The motion was unanimously carried.

On the proposition of Sir H. Cartwright, seconded by Mr. H. Bailey, dividends at the rate of 11½ per cent. per annum on the "A" stock and 8½ per cent. on the "B" and "C" stocks were declared.

A vote of thanks was next passed to the officials and staff for their attention to the business during the half year. Both Mr. Randall and Mr. Broadberry responded. The latter made the interesting statement that in two years the increase in the quantity of gas made and distributed had been 25·7 per cent. The increase in the past half year was 32 millions. When he took charge of the works in 1874, the total make in the year was 68 millions; so that the increase in the past half year was nearly half as much as the total make in 1874.

Hearty recognition having also been made of the services of the Chairman and Directors, the proceedings terminated.

BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Meeting of this Company was held at the Bell Hotel, Bromley, on the 25th ult.—Mr. Alexander Dickson in the chair.

The Secretary (Mr. H. W. Amos) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ending Dec. 31, the principal features of which were dealt with in the "Journal" for the 16th ult., was presented.

The Chairman, in moving the adoption of the report and accounts, said he thought the shareholders would agree with him that the most important and gratifying feature of them was the announcement of a substantial increase in the sale of gas during the past half year, which had been 12½ million cubic feet more than in the corresponding period of 1895. They had had an increase of 323 consumers; and in having attained to their present consumption they had completed, as it were, the second grade in their advance of hundreds of millions in the output of gas, inasmuch as they had supplied during the year 1896, 201 million cubic feet, whereas in 1890 the figures for the yearly supply were 141 millions. So that they had augmented the annual output by 60 millions in the last six years. The gas-rental had also increased by £1800. Having made so much more gas, they had, of course, carbonized more coal to the extent of 1300 tons; but as it did not cost them quite so much per ton as in the previous six months. The increase of the outlay on raw material amounted only to £850. The make of gas per ton had been slightly improved. This constituted practically the silver lining to the cloud—the cloud being the residuals. The price of coke was low, owing to over-production in the first three months of 1895; and the Company had dropped about £500 or £600 on the half year. But the Directors hoped for a partial improvement when the time came for renewing their contracts. He feared it was not possible to say the same of sulphate of ammonia, which had had a very chequered career during the last few years, unless the farmers, taking advantage of the better prices they obtained for their wheat during last autumn, might feel disposed to be a little generous in the application of enrichers to their land. Turning to the accounts, economy had, he said, been effected in wages to the extent of £170 by the use of stoking machinery which had been at work during the whole of the six months. There had been increased returns to the amount of £1724, and greater expenditure by £913; so that there was a greater profit by £811 on the half year. He thought this result very satisfactory; and it induced him to call to mind that, as it was often said, there were advantages in being small, as it enabled them to fit into conditions which might prove positively uncomfortable to concerns of larger proportions. Being a comparatively small Company, they had weathered the stress of the depressed prices ruling in the residuals market without having to contemplate alternatives of resorting to the reserve fund, reducing the dividend, or raising the price of gas. In connection with the last matters, the Chairman explained the operation of the sliding-scale, and went on to say that in the past half year the Company had supplied the consumers with 107 million cubic feet of gas at 1s. 6d. per 1000 feet below the standard price; and in this way they gave them £8056 out of the surplus profits above the standard dividends. The shareholders were entitled on this basis, in their proportion, to have divided £2722; but as a matter of fact they had only taken out of the profits in the past half year, in additional dividends, the sum of £907. At present 1d. per 1000 cubic feet on the quantity of gas sold involved £900 per year; while ¼ per cent. dividend to the shareholders involved £300 per year. So that out of every £1200 surplus the consumers, in the reductions to which they were entitled, would take three-quarters of the profits, while the shareholders only took one-quarter. The Directors were doing their very best in the administration of the affairs of the Company, and at the same time endeavouring to promote the common interest of both shareholders and consumers. The question of improving the public lighting was engaging attention; and some experimental lanterns and burners had been erected in the main thoroughfares of the town. Their Engineer (Mr. W. W. Woodward) had obtained one of the newest burners—a Denayrouze. It had been fixed outside the hotel in which they had met; and certainly its effects were remarkably brilliant. A special display of groups or single burners of this kind could be seen at the Aquarium, at Westminster, and, though electric lighting was in use there also, the gas-lighted part, with these burners, was the brightest part of the building.

Mr. B. Latter seconded the motion; and it was carried.

Dividends at the rates of 11½ and 8½ per cent. per annum, as recommended in the report, were then declared.

The retiring Directors and Auditors having been re-elected,

A vote of thanks was accorded to the Engineer, the Secretary, and the other officials, for the excellent manner in which they had discharged their duties.

Mr. Woodward, acknowledging the compliment, testified to the ability and willingness of the men employed on the Company's works.

The proceedings closed with a vote of thanks to the Chairman and Directors.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Thursday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. James Glaisher, F.R.S., in the chair.

The Secretary and Engineer (Mr. J. L. Chapman) having read the notice calling the meeting,

The Chairman moved the adoption of the report and accounts, and proceeded at once to compare the principal items in the latter with those of the corresponding half of 1895. Looking at the expenditure side of the revenue account, he said it would be seen that, under the head of manufacture of gas, coal had cost £2683, or an additional £247. Carbonizing wages showed an increase of £33; and repairs and maintenance of works, £40. It was at all times a pleasure to him to see a fairly round amount spent on repairs every half year. He held that it was strict economy to keep every part of the plant in good working order; and this had been done by Mr. Chapman in the past half year. Scarcely any other of the items of expenditure differed much, excepting rates and taxes, which had an unfortunate knack of increasing year after year. The total expenditure was £5098; being £322 more than in the corresponding period of last year. Turning to the other side of the accounts, it was found that, by the sale of gas in the Michaelmas quarter, they received an increase of £239; and in the Christmas quarter, a further £176—making £415 in the half year. Meter and stove rentals were also more by £45. As to the residuals, coke had done pretty well, and the revenue from tar was rather more; but the diminished value of breeze and sulphate of ammonia made the total amount received for residuals less by £28. The total revenue in the half year was £7455; being an increase of £432. The profit was £2356, or about £110 more. This enabled them to declare the usual dividends; and to pay £100 off the suspense account, and £30 or £40 off fittings, &c.—leaving £54 to carry forward. He thought that, under present circumstances, this was a favourable report. The quantity of gas made was 30,586,000 cubic feet, which was 2,536,000 feet more. The quantity of gas consumed was 28,266,000 cubic feet; being an increase

of 1,972,000 feet, or at the rate of 7½ per cent. Of the amount sold, 25,276,000 cubic feet was on private accounts; being an increase of 1,802,000 feet. The gas consumed by the public lights and under contract was 2,990,000 cubic feet, or an additional 170,000 feet. The unaccounted-for gas was 1,870,000 cubic feet, which was a rise of 414,000 feet—that was to say, the leakage had been at the rate of 6 1/10 per cent., as against about 5 per cent. in the corresponding period of the preceding year. When he considered that they had to drive the gas from Harrow to Stanmore, and that the pressure required to give a satisfactory supply was 38-10ths at the works, he did not feel surprised at the increase in the unaccounted-for gas—indeed, if it never exceeded 6 per cent. he should make no complaint whatever. There was yet another reason. They had more gas cooking-stoves in use; and it was essential that, during the hours when cooking was proceeding, they should give a greater pressure than there would be if these stoves were not employed. With regard to the 7½ per cent. increase in the sale of gas, he was curious to know how it was spread over the district. They had three different districts—Harrow proper, called the inside radius; Sudbury and Harrow-Weald, called the outside radius; and Stanmore. The amount of gas consumed in the half year at Harrow was 16,346,000 cubic feet; being 703,000 feet more than in the corresponding period of last year. This increase (which was represented in money by about £150) was only at the rate of 4 3/10 per cent. In the district of Sudbury and Harrow-Weald, they sold 3,158,000 cubic feet; being an increase of 426,000 feet, or 13 per cent. This was represented in money by £94. Having so recently amalgamated with Stanmore, he had looked very anxiously at the figures for that district. There they had sold 5,772,000 cubic feet—being 678,000 feet more than in the December half of 1895, or nearly as much in excess as the whole of Harrow; and its money value was represented by £151. It was evident therefore that the greater part of the 7½ per cent. increase was due to the portion of their area outside Harrow proper; and this was interesting to see. It was certainly the district where they paid the higher price; so that, taking it altogether, it was very gratifying. A notable point about the increase at Harrow in the half year was that in the Michaelmas quarter it was 683,000 cubic feet; while in the Christmas quarter, it was only 20,000 feet. Indeed, they did not do more than hold their own in Harrow in the latter quarter; for they sold 11,322,000 cubic feet, as compared with 11,302,000 feet in that period of 1895.

Mr. C. Horsley, J.P., seconded the motion, which was adopted.

Dividends at the rate of 7½ per cent. per annum on the original "A" capital, 7 per cent. on the additional "B" capital, 5¼ per cent. on the additional "C" capital, and 6 per cent. on the guaranteed shares were next declared.

The Chairman then proposed, and Mr. A. Baynes seconded, the re-election of Mr. Horsley as a Director. This having been agreed to, on the motion of Mr. Baynes, seconded by Mr. Horsley, Dr. J. W. Lee Glaisher was also re-elected.

Mr. W. G. Chapman moved that Mr. James Randall, the retiring Auditor, be re-appointed, and Mr. Horace J. Rydon be elected in the place of Mr. F. G. Fenton, who had resigned through failing health.

Mr. A. F. Phillips seconded the motion, which was carried.

A special resolution was passed, recognizing the careful attention Mr. Fenton had given to his duties during the many years he had held office.

Mr. Horsley moved a vote of thanks to Mr. Chapman and the staff.

Mr. Phillips, in seconding, took the opportunity of remarking that he was very pleased with the figures the Chairman had given, showing the increase in business at Stanmore. He had always advocated the amalgamation, because he was persuaded that it would eventually add materially to the prosperity of the Company. He now felt still more confident in that conclusion through the satisfactory increase of the past half year.

The motion was heartily agreed to.

Mr. Chapman, in responding, mentioned that, if the Company had received the same price for sulphate of ammonia in the past half year as they did three years ago, they would have earned 1 per cent. more upon the original capital. Considering the condition of the residuals market, he thought they had done well in being able to present such a balance-sheet as they had laid before the shareholders that day.

On the proposition of Mr. Bannister, seconded by Mr. Randall, the Chairman and Directors were likewise thanked for their attention to the interests of the Company.

St. Petersburg Water-Works Company, Limited.—The ordinary general meeting of this Company was held last Tuesday, at the Cannon Street Hotel. Mr. W. T. Western presided; and, in moving the adoption of the report (which was noticed last week), he said they had received the instalment of the purchase money from the Municipality with notable punctuality, and they were able to propose a rather larger dividend than on the last occasion. In 1895, the Company had to bear certain extraordinary expenses; but in the present accounts, there was what he might call a little extraordinary profit. Last year a considerable sum was put down for income-tax. The amount claimed by the English tax-collectors was more than the Directors considered they ought to pay. They disputed the amount; and he was happy to say they won. The consequence was the sum they had to pay this year for income-tax was less than it would be in future; for they had the benefit of the overplus which was carried forward last year in case they had to pay the amount claimed. The rate of exchange had hardly varied during the year—in point of fact, the Russian Government had taken steps which were tantamount to the resumption of specie payments; and as long as they adhered to this policy, they might expect to receive the same amount as in the past year. As to the future, the Directors were waiting for the City of St. Petersburg to make up their minds whether or not they would pay off the Company. The question had been considered by the Finance Committee; and the Town Council were discussing a project for a large loan, one of the items of which was for the purpose of redeeming the sum they had to pay the Company. The other matters were of a highly controversial nature; so that it was likely to be some months before the Council did anything. It showed, however, that they had not forgotten the question, and were keenly alive to the advantages to themselves of taking this step. Mr. R. S. Guinness seconded the motion (which included a recommendation for the payment of a dividend of 5s. 6d. per share, making 10s. for the year); and it was adopted. The retiring Directors and Auditors were also re-elected.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The Directors of the British Gaslight Company, Limited, recommend a dividend at the rate of 10 per cent. per annum for the half year ending Dec. 31, with a bonus of 2s. 6d. per share, both free of income-tax.

Despite the competition of the Electric Lighting Company and the low prices received for residuals, the Directors of the Chelmsford Gas Company are able to report that an additional £555 was earned during last year. The receipts on the revenue account amounted to £7921; and the balance, to £2423. The amount available for distribution was £2148; and dividends of 7 per cent. on the original shares and £4 18s. on the additional shares have been declared. The amount of gas sold showed an increase on the year of 1,179,900 cubic feet.

The report presented at the annual meeting of the Dartmouth Gas Company yesterday week stated that the consumption of gas continued to increase, not only for lighting, but for cooking and heating purposes; and the past year's business was of the most satisfactory character. In the outlying parts of the town, the mains are being relaid; and during the present year, it is proposed to renew and enlarge the purifying plant The receipts for the past year were £3529; and the expenditure, £2849—leaving a balance of £680. It was decided to pay a dividend of 13s. per share, which would absorb £455. The remainder was added to the amount carried forward, which was thus increased to £1169.

The half-yearly general meeting of the Dover Gas Company was held on Monday last week—Mr. Wilsher Mannering in the chair. The Directors reported that the six months ending Dec. 31 had been a prosperous period, and that they had been enabled, out of the profits made in the past year, to discharge the entire cost of the application of incandescent burners to the public lamps. As the increase in the consumption of gas, which was temporarily checked by the use of these burners and the electric light, appeared to have returned to its normal rate, a portion of the new retort-house would have to be made ready to be brought into use before next winter. They recommended the usual dividend at the rate of 7½ per cent. per annum. The accounts showed that the receipts in the six months were £16,333, while the expenditure was £13,446; leaving a balance of £2887. This added to the profits brought forward made a total of £5713. After the payment of the dividend recommended, there would be a balance of £204. The Chairman, in moving the adoption of the report, said there had been a net increase of 1¼ per cent. in the sale of gas. The quantity paid for was 89,299,800 cubic feet, as against 88,188,000 cubic feet in the corresponding half of 1895. Though 1,111,800 cubic feet more gas had been sold, 115 tons less coal had been used. This was due to the fact of the leakage being 6 as against 7 per cent., and to the larger yield of gas per ton—11,224 cubic feet as compared with 11,040 cubic feet. This was an excellent result, evidencing both the efficient condition of the plant and the skill and careful attention given to manufacturing operations. Having dealt with the various items in the accounts, the Chairman referred to the necessity, owing to the growth of the Company's business for increasing the gas producing power of the works by about 25 per cent., for which, and a contemplated extension of mains, he said more money would be required. He pointed out that no addition to the capital had been made since 1891; and that at present it was less than £6 per ton of coal carbonized—a lower figure than it had stood at for a long time. In conclusion, he expressed his appreciation of the continued faithful and valued services of the officers and men, to whom, he said, the Company were indebted for the successful results of the past half year. The report was adopted. A vote of thanks to the Chairman and Directors having been acknowledged by the former, a similar compliment was paid to the officers and staff. The Manager (Mr. R. Herring), in responding, expressed his appreciation of the considerate treatment he and those under him received from the Directors, and assured them that he would continue to do his best for the prosperity of the Company.

The receipts of the Dronfield Gas Company in the past year amounted to £1320; the expenditure to £836—leaving a balance of £484. The sum available for distribution was £1205; and at the meeting of the Company last Wednesday, the Directors recommended a dividend of 5 per cent., free of income-tax. The Chairman (Mr. J. H. Harrison) presided, and, in moving the adoption of the report, congratulated the shareholders upon the fact that, notwithstanding the reduction of 3d. per 1000 cubic feet in the price of gas, the dividend had been maintained, which proved that the efforts of the directorate in popularizing the use of gas had been attended with success. The works had been kept in a state of efficiency; and he believed the shareholders possessed a property which would compare very favourably with any gas undertaking in the country. The Vice-Chairman (Mr. C. E. Jones, Assoc.M.Inst.C.E.), in seconding the motion, observed that the year 1896 proved on the whole a better one than the preceding; for they had used less coal, and sold more gas per ton carbonized. This result was mainly attributed to the fact that the Board had had the mains and service-pipes overhauled, and all leakages—to which they were specially liable in mining districts—thoroughly stopped. There was a very considerable falling off in the sum realized by the sale of residual products, especially ammoniacal liquor; and if the price of sulphate continued to fall as it had been doing for years past, he anticipated it would soon have to be given away. Rates and taxes had gone up by leaps and bounds. Nineteen years ago the Company paid £10 a year; in 1896 they paid upwards of £74. Unfortunately, their income did not increase correspondingly. Referring generally to the gas undertakings of the country, he expressed his pleasure at noticing a progressive development, which, in spite of rival lights, was not less than 8 per cent. per annum. Incandescent gas lighting was making immense strides; and prepayment meters were of proved advantage in popularizing the use of gas. The production of carburetted water gas was also making headway; and it was evident it had "come to stay." This system would absorb a portion of their coke, and obviate the necessity for carbonizing so much coal as now. In London, Liverpool, Birmingham, and other places, many millions of cubic feet of water gas were now being made to partly supersede coal gas by being mixed with it; and it could be produced at a lower cost. The report was adopted, and the dividend recommended declared.

At the recent annual meeting of the East Grinstead Gas and Water Company, the Directors, in their report, stated that the receipts from the

sale of gas last year were £3223, as compared with £2925 in 1895; from residuals, £618, against £708; and from water, £1390, against £1328. The accounts showed an available balance of £1374, out of which dividends of £6 and £4 4s. per cent. per annum were recommended on the respective shares. It was also proposed to write off the balance of £104 of the capital account lost by the bank failure in 1892. The Chairman (Mr. W. V. K. Stenning, J.P.) moved the adoption of the report and its recommendations. He said the chief portion of the increase they had was derived from prepayment meters, of which they had about 100, producing something like £200 a year. The report was adopted.

The annual general meeting of the Hertford Gas Company was held on the 25th ult., Mr. A. S. Gilbertson in the chair. The Directors reported a sum of £1284 as profit on the revenue account, and a balance of £901 available for distribution. They recommended a dividend for the past year on the new preference shares at the rate of 5½ per cent., and on the original and new shares at the rate of 5 per cent., free of income-tax. The accounts accompanying the report showed that, under the supervision of the Company's Manager and Secretary (Mr. R. Watson), the quantity of common coal carbonized was 2499 tons, and of cannel coal 230 tons. The gas made was 26,290,300 cubic feet, of which 23,071,400 cubic feet were sold, 701,200 cubic feet used on the works, and 2,517,700 cubic feet unaccounted for. Several important alterations and extensions have been made upon the works, including the erection of a new retort-house and coal store; the former being furnished with regenerative settings. The expenditure on this work up to the end of last year was £1978. In moving the adoption of the report, the Chairman remarked that the profits would have been larger but for the outlay on repairs, which, of course, would not occur in the current year. They had done very well with prepayment meters. The make of gas per ton was not very satisfactory; but he did not think they must take too much notice of this, because with the old plant it was most difficult to keep the supply of gas going at all. Leakage had been reduced by about 2 per cent., and was now 9½ per cent.; and the Directors hoped for a still further reduction. In the spring of last year, the question of the extension and improvement of the works was gone into by the Directors; the plans of their Manager were approved, and tenders were invited for the work, which was now finished. They started making gas with the new plant on Feb. 9; and the old plant had not been used since Feb. 12. They hoped great things from this change in the system of manufacture. The consumption of gas had increased; and, from what the Manager had stated, a further augmentation might be anticipated in the present quarter. The report was adopted; and the dividends recommended were declared.

A report which Mr. T. D. Wivell, the Chairman, described as eminently satisfactory, was presented at the annual meeting of the Ilfracombe Gas Company last Wednesday. It appeared that, after carrying £200 to the reserve fund, there was a balance of £728 available for distribution, out of which the Directors recommended the payment of dividends of 2½ per cent. on the 5 per cent. preference stock and consolidated ordinary stock for the half year ended Dec. 31. The make of gas last year was 35,328,800 cubic feet—an increase of 1,334,200 cubic feet over the preceding year. The number of ordinary consumers increased from 831 to 850, and of prepayment consumers from 222 to 308. The Chairman said that, notwithstanding the reduction of 3d. per 1000 cubic feet in the price of gas, and the disastrous fire which so interfered with business in the town last year, the receipts of the Company had considerably improved, and the consumption of gas was greater. If the present rate of increase was maintained, the building of the new works at Hele would probably be commenced next year. The adoption of the report, moved by the Chairman and seconded by Mr. H. A. Willey, was agreed to; and the dividend was declared.

The report of the Directors of the Kingston-on-Thames Gas Company states that the business of the Company during the past half year has progressed satisfactorily; there having been a large increase in the sale of gas over the second half of 1895, which is in a great degree attributable to the dull weather during the latter part of last year, and to the increased demand for cooking and heating stoves, as well as the number of new consumers in the outlying districts. A new gasholder has been completed, and is now working in a highly satisfactory manner. The statement of accounts shows that the income for the six months was £30,083, of which £24,940 was for gas consumed and meter and stove rentals, and £3642 for coke sold. The profit made was £5493. The available balance in June was £13,751; but on Dec. 31, it had risen to £14,432. Dividends of 10 and 7½ per cent. are to be paid.

The profit of the Lewes Gas Company for the past half year amounted to £1654; and after providing for interest on mortgages, the balance of net revenue was £2092. Presiding at the meeting of the shareholders last Wednesday, Mr. James Broad stated that, notwithstanding the great complaints which were made generally in consequence of the reduction of the value of residuals, he was pleased to say they had held their own in this respect. There had also been an increase in the receipts for gas; and altogether the shareholders were to be congratulated on the success of the half year—a result that must be due to the zeal of their Manager, Mr. Levi Monk. The report was adopted; and the Directors were authorized to pay a dividend of 5 per cent. on the consolidated original capital stock, and of 3½ per cent. on the additional capital stock.

At the meeting of the Londonderry Gas Company last Tuesday, the Directors reported that, after providing for all charges, there was a profit-balance of £4264 as the result of the working in the past year. Out of this they recommended the declaration of a dividend at the rate of 11 per cent., free of income-tax. This would leave a balance of £304 to be carried forward. Having considered the continued increase in the consumption, and the satisfactory results of the Company's working, with the probability of an improvement in the market for residual products, they had resolved to reduce the price of gas to 3s. 6d. per 1000 cubic feet to private consumers, and 1s. 6d. for each public lamp. In moving the adoption of the report, the Chairman (Mr. W. Tillie, D.L.) remarked that, notwithstanding the loss sustained in consequence of the withdrawal of some of the public lighting, it had been more than made up by the increase since. The past year was a "record" one; the total production of gas having been upwards of 75 million cubic feet, or nearly 4 millions more than in 1895. He was pleased to learn from their Manager (Mr. J. Macnie, Assoc.M.Inst.C.E.) that the increase had been going on satisfactorily since the 1st of January. The profit for the year was more than sufficient to pay the usual dividend by about £600; and the Directors thought it was fair and right to divide it between the shareholders and the consumers. They were only able to make a reduction of 1d. per 1000 cubic feet; but this on the present consumption was about equal to 1 per cent. on the dividend. Though they had only given 1d. now, they had made a reduction of 4d. per 1000 cubic feet in two years; and he had no doubt they would be able to do something more before long. The only unsatisfactory thing about the working of the Company was the low price of residuals. In 1891, the price realized was very nearly as much as the total amount paid in dividends. Last year, only a little more than half was made; but, as far as could be judged, the market was improving, and perhaps they would be an element of prosperity in the future business of the Company. There was no doubt that some people believed that suppliers of gas were still menaced by the electric light; but for his part, with the improvements constantly taking place in gas and the mode of using it, he did not think the electric light could ever do gas companies much harm. Sir William Miller, in seconding the motion, said he thought both the shareholders and the public would agree with the proceeding of the Directors in sharing the sum available for dividend. It was satisfactory to see a large increase going on year after year in the Company's business; and he took leave to say that, to a considerable extent, the present position of the concern was owing to the admirable way in which the Secretary and Manager, and the staff under him, managed their affairs. The report was adopted.

The report and accounts of the Redhill Gas Company were presented to the shareholders last Thursday week. The Directors had the same tale as others to tell of increased gas consumption, but diminished profits through the low price of residuals. The accounts showed a balance of £4991; and the Board recommended a dividend of 10 per cent., of which 4½ per cent. had already been paid. The Directors lamented the death of Mr. F. B. Hallowes, who had been a member of the Board for 23 years. In moving the adoption of the report, the Chairman (Mr. James Lees) informed the shareholders that during the past year the carbonizing plant had been in a great measure reconstructed; and it was hoped that this would promote economy and efficiency. The large additional quantity of gas sold was, he thought they might fairly say, due to its moderate cost, and the continued development of the prepayment meter system. They had 500 of these meters in use; and applications for them were still coming in. Even in their small way, they had spent £2000 in fitting up these meters; and this accounted for the fact that the capital was overdrawn by £1303. The experiment of lighting the roads with incandescent burners still continued; and this year the Company had taken all the lamps into their own hands. He had himself taken out a patent which was being used in the street-lamps; and he had much pleasure in placing it without charge at the disposal of the Company. The cost of making the necessary re-arrangement only came to 10s. for each lamp. With regard to the progress of the business, he mentioned that since he had been Chairman the make of gas had increased from 43 million cubic feet to 73 millions; and of this 11 millions had been within the past three years. The balance sheet, he thought, was a very satisfactory one. From gas they had received £12,394; rental of meters, £286; rental of stoves, £42; and residual products, £2984. The balance to be carried to the profit and loss account was £4456. In their report, the Directors suggested that a 10 per cent. dividend should be declared upon the present capital; but this was not quite covered by the £4456. They had, however, a balance of about £500, from which they could take the small additional amount required. Mr. H. Stenning having seconded the motion, it was adopted.

The revenue of the Ripley Gas Company last year amounted to £3174; and, after meeting all charges, a balance of £1419 remained, including £251 brought forward. A dividend of 10s. per £5 share is to be paid; and a balance of £369 will be carried to the current year's accounts.

At the annual meeting of the Rugby Gas Company last Saturday week, the Directors were able, in spite of a reduction of 2d. per 1000 cubic feet, and the depreciation in the value of residuals, to declare a dividend of 12 per cent.; the net profit for the year being £5316. During the year 7107 tons of coal were carbonized; and the residuals realized £2410.

The business of the Slaithwaite Gas Company is developing—slowly, it is true; but the Directors are following the right lines for securing increased custom. The amount received for gas last year showed an addition of £148; and with the view of encouraging greater demand, the Directors have (as already announced in the "JOURNAL") reduced the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet. Above 200 prepayment meters have been fixed. The net profit for the last year, after paying interest on the loan capital and preference shares, is £1031; and the balance from the previous account made £1096 available for a dividend of 10 per cent. This has been declared; and the balance is to be placed to the reserve fund.

In moving, at the annual meeting of the South Shields Gas Company on the 26th ult., the adoption of the Directors' report, noticed in the "JOURNAL" on the previous Tuesday, Dr. J. F. Armstrong, who presided, in the absence of Mr. R. Wallis, the Chairman of the Company, through ill-health, stated that 1500 tons more coal had been carbonized last year than in the preceding twelve months, at an expenditure of £500. They had sold upwards of 400 million cubic feet of gas; and the net rental amounted to over £46,000, which was £720 more than the previous year. The Corporation of South Shields had lit up the Market Place and King Street with the electric light; but what the Company had lost there with gas they had gained in other parts of the district. There had been an increase of 506 consumers during the past twelve months. He thought the Company had been as successful as in previous years. Sulphate of ammonia had been extremely low, and they received £1700 less in this respect than in 1895; but all the gas companies had suffered alike. He thought their report was as satisfactory as that of any other company. During the twelve months they had been enabled to obtain more than 16-candle gas, and keep the sulphur down. The previous year they could not do the latter. He was happy to state that they had at last managed to keep it down; but how it was done, they could not tell. After paying the dividend which was due, they had been enabled to leave a balance of £967 odd to carry forward; and the reserve fund was the same as last year. The report was adopted; and the dividend recommended was declared. At the close of the ordinary business, authority was given for the raising of £10,000 of new stock by auction, and £5000 on bonds.

At the recent annual general meeting of the Tonbridge Gas Company,

the Directors reported that the results of the past year's working had been highly satisfactory, for notwithstanding a second reduction of 2d. per 1000 cubic feet in the price of gas, the revenue account showed a profit of £2926, as compared with £2229 for 1895—an increase of nearly 33·3 per cent. The profit and loss had a balance of £3843, from which they recommended a dividend of 11 per cent. on the "A" stock, 8 per cent. on the "B" and "D" stocks, and 5 per cent. on the "C" stock; leaving £2773 to be carried forward. There was the very satisfactory increase of 5,536,400 cubic feet, or 13·75 per cent., in the consumption of gas; and the Directors had every reason to believe this would be maintained. The unaccounted-for gas was very much reduced during the past twelve months. The early part of the year, being exceptionally mild, was very unfavourable to the sale of coke; and though a considerable quantity more was sold, the sum realized was much less. The Directors announced their intention to reduce the price of gas from 3s. 2d. to 3s. per 1000 cubic feet as from the 31st inst. The Engineer and Secretary (Mr. J. Donaldson) reported that the works and plant had been maintained in a very satisfactory condition. The extension to the retort-bench was completed, and would increase the productive power of that portion of the plant by 50 per cent. The report having been adopted, Mr. G. D. Warner moved a vote of thanks to the Chairman and Directors. He said he must heartily congratulate them on the excellent balance-sheet presented, and referred to the care and attention they had taken in the supervision of the Company's business. He also proposed a similar vote to the Engineer and Secretary; remarking that, well as the Directors had discharged their duty, they would be the first to admit that, had they not such a capable and hardworking Manager, they would scarcely have done so well. He also referred to the satisfaction he had always felt when conferring with Mr. Donaldson. The votes were unanimously accorded.

The Directors of the Winchester Water and Gas Company, in their half-yearly report, stated that the receipts on revenue account amounted to £10,954, and the expenditure to £6994. The balance of profit and loss account was £5634, out of which dividends were recommended of 10 and 7 per cent. per annum. At the recent meeting of shareholders, the Chairman (Mr. W. Barrow Simonds) said it was satisfactory to find that there had been an increase in the consumption of gas by £600 odd, and in water-rents of £117, as compared with the corresponding half of the preceding year. There was a considerable reduction in the returns from coke; but this was a matter of necessity, because they were now using it in the manufacture of gas. This was remarkable, because a short time ago great fault was found with regard to their large stock of coke; but now they had none. This was the first meeting of proprietors since the water-gas plant had been used; and though at first there was trouble to contend with, the work was now going on in a satisfactory way. He complimented the Engineer and Manager (Mr. F. G. Dexter) on the success of his labours in this respect. The Directors proposed to reduce the price of gas 2d. per 1000 cubic feet, to take effect at the Michaelmas quarter; making the figure 3s. 4d. The report was adopted.

Water Companies.

Mr. H. Rokeby Price presided over the ordinary half-yearly meeting of the shareholders of the Leatherhead Water Company, and presented a report which showed that the prospects of the Company are very promising. The receipts for the six months amounted to £1616; being £134 in excess of the corresponding period of 1895. The profit on the half year was £753, which, added to the balance brought forward, made a total of £1109. The interest on the debenture stock would only absorb £125; and from the remainder a dividend at the rate of 3½ per cent. per annum was declared—1 per cent. more than this time last year. The increasing demand for water has made it necessary to considerably extend the storage accommodation; and a larger reservoir (to hold 1,100,000 gallons), at a higher elevation than the present one, is now in course of construction. To meet the cost of this, new capital amounting to £6200 has been issued.

The Woking Water Company held their half-yearly meeting last Tuesday, at the London offices, under the chairmanship of Mr. Charles Horsley, J.P. In addressing the shareholders, he said that during the past year they had not had so much trouble as in the previous one. The revenue for the twelvemonth had been £6573, compared with £6194—an increase of £379, or rather more than 6 per cent. The loss in the revenue, however, on account of the restricted supply to the Railway Company, and on large meter supplies, was approximately £170. This was due to the Directors having asked the Railway Company and the owners of gardens to assist them during the summer by using as little water as possible. The expenses on revenue account were £2901, as against £2493 in 1895, or an increase of £407. Rates and taxes were going up; and the valuation of the Company's property had been increased by £701. Consequently, they had had to pay £96 more under this head. The profit for the year was £3672, compared with £3700 in 1895. The expenditure on capital account showed an increase of £4317. During the year, 8100 yards of new mains had been laid; three new shafts, as well as borings, had been sunk; and considerable lengths of adits had been driven and deepened. From what their Engineer (Mr. Joseph Quick) reported, they might say they had a fair increase in the supply of water so far; and the Directors trusted, when these operations were completed, they would have sufficient for the district for some time. Building operations had been proceeding actively in the neighbourhood; and the number of new consumers continued to increase. The sum of £110, the balance of the extraordinary expenditure incurred through the frost in the early part of 1895, had been written off the profit and loss account. The balance-sheet admitted of the payment of a dividend at the rate of 4 per cent. per annum, and then leave £94 to be carried forward. He proposed the adoption of the report; and the motion having been seconded by Mr. R. Hesketh Jones, J.P., was adopted. The retiring Director (Mr. A. H. Baynes) and Auditor (Mr. J. E. Plummer) were re-elected. The Chairman mentioned that notices had been forwarded to the shareholders asking for offers for debentures (repayable in twenty years) at £110 per cent.; but it was now proposed to issue them as perpetual debentures.

Proposed Important Extension of the Chelmsford Water-Works.—The Chelmsford Town Council have under consideration a scheme for the extension of their water-works at a cost of about £10,000; the work involving the construction of a new deep well and two reservoirs.

THE STRIKE AT THE DERBY GAS-WORKS.

In the last number of the "Journal," we brought the account of the strike at the Derby Gas-Works down to the point at which the dissatisfied men who had thrown up their employment had been replaced by other hands imported from Manchester through the instrumentality of Mr. Graeme Hunter. These men were put to work, and on Saturday, the 27th ult., things were going on as satisfactorily as could be expected under the circumstances. Applications for work were being constantly received from men in the town and district. Though it was thought prudent to ask the consumers to be as economical as possible in the use of gas, it was hoped that they would be kept well supplied. Of course, a certain amount of inconvenience was experienced by the townspeople; and a feeling prevailed on Monday last week that some efforts should be made to submit to arbitration the matters in dispute. Speaking to a Press representative on that day, the Company's Secretary (Mr. R. Fisher) stated that they had about the full number of men to carry on the work. At Cavendish Street—where, we may mention, the men have stood faithful, the stokers' demand for an advance having been conceded by the Directors, to whom the application was made direct—there were absolutely no imported men; while at the Litchurch works there were about 100. All the men were, he said, being kept in the works, where they slept and were fed; but they were permitted to communicate with their families as freely as they desired. Mr. Lewis Wilshire had called upon the Directors to proffer the intervention of the Derby Conciliation Board—a body of gentlemen comprising six members of the Derby Chamber of Commerce and six members of the Derby Trades Council. Mr. Fisher, however, informed Mr. Wilshire that he did not consider the matter ripe enough for the proposed intervention. The Company had not disputed the men's demands at all, because they had not gone into them; but if, after investigating them carefully, they found themselves in actual dispute with the men, they would consider the advisability of invoking the services of the Conciliation Board. On Tuesday last, the situation remained unchanged. The new hands were making gas better than they had done since the commencement of the strike; and those who were found unsuitable for the work had been superseded by others. The arrangements for bringing in and provisioning the men were left entirely in the hands of Mr. Hunter. Mr. Fisher also stated that the Directors were looking into the demands of the men for the benefit of those who had remained faithful; and he had no doubt that most of them would be granted. On Thursday matters were about in the same position as on Tuesday. There had been no direct attempt at a settlement on either side; and the Company, on their part, claimed to have surmounted all difficulties. The imported men had undergone a weeding-out process; the unsuitable ones being discharged, and stronger hands engaged. Among the fresh men were about a score of experienced hands, who proved to be very useful. Mr. Fisher stated that the Company had to refuse numerous applications for employment, on the ground that they had as many men in their service as they required. On Saturday the prospects of an amicable settlement between the parties appeared to be as remote as they were at the beginning of the week. There were no fresh developments to report, and Mr. Fisher stated that matters from the Company's point of view were satisfactory. Mr. W. Thorne, the General Secretary of the Gas Workers' Union, in an interview with a Press representative, said the men were still willing to refer the dispute to the Derby Conciliation Board for settlement. The men on strike were remaining firm, and there were about 120 of them receiving pay from the Union. With regard to the supply of gas, we are in a position to state that at 6 a.m. each day during the past week the Resident Engineer and Manager (Mr. C. Taylor) maintained about four-fifths of the normal total stock of gas, or three-fifths of the maximum gasholder storage, while sending out to the consumers from two-thirds to three-quarters of the usual supply. At the Litchurch works, the production of gas by the new hands increased daily; and at the end of the week it was expected that the normal pressure would be resumed. A public meeting was held in the Market Place, Derby, last Sunday, in connection with the strike, under the auspices of the Derby Trades Council. Mr. T. Mawbey, J.P., presided. Mr. W. Thorne advised the men to stand firm, and prophesied that the "blacklegs and ex-convicts" imported from Manchester would not long remain in the employ of the Company.

In our notice of the strike last week (p. 481), the standard rate of wages demanded for day work in item No. 3 was, by a misprint, given as 25s. instead of 23s.; and the remarks referred to in connection with the first deputation were made after the Directors received the deputation mentioned in the second paragraph of the article.

THE LAMPLIGHTERS' STRIKE AT NEWCASTLE.

The Attitude of the Gas Company's Men.

Respecting the statement in the "Journal" last week, that the Executive of the National Amalgamated Labour Union had decided that the gas workers of Newcastle should take a ballot to determine whether they should strike in sympathy with the lamplighters who had left work with the view of forcing compliance with their demands for higher wages, we learn that the Gas Company have recently made concessions to their employees in the way of holidays and other benefits; and it is presumed by the Directors that they have no grievances of their own to advance. The Company's men do not belong to the Gas Workers' Union, but to the above-named Labour Union, one of the rules of which is that "no cessation of work shall take place unless two-thirds of the members belonging to the branch or body 'immediately concerned' shall have voted in favour of the adoption of such a course." It is suggested that the phrase "immediately concerned" prevents the gas workers from legally coming out on strike in a matter in which the lamplighters and not the gas workers are "immediately concerned." Whether this is so or not, a meeting of gas workers held during the week agreed that a ballot should be taken at once regarding the proposal for them to strike; and, in order that no misapprehension should prevail, it was arranged that meetings of other shifts of the men should also be held.

The position of the dispute with the lamplighters was dealt with in a report submitted to the City Council by the Watch Committee last

Wednesday. The result of a long discussion thereon was the adoption of the Committee's finding that the men should receive 1s. a week advance in their wages, and seven instead of three days' holiday per annum, failing the acceptance of which the matter should be submitted to arbitration—in other words, a confirmation of the offer the men had previously received, and had not accepted. The men require an advance of 2s.; and the Gateshead Corporation have conceded this. But it is pointed out that the cost of a 2s. advance would in Newcastle be £350 a year; that there are 800 labourers of the lamplighter type employed in various departments by the Corporation; and that the success of the lamplighters would probably mean similar applications from all classes, which could scarcely be declined if the lamplighters had been granted the 2s. advance. It is calculated that this would cost the Corporation about £4000 per year more. The lamplighters, on the day following the Council meeting, resolved to stand firm to their original demand; and the proposal as to arbitration did not meet with acceptance.

A correspondent of a Newcastle paper states that a large meeting of the gas workers was held on Saturday, to consider their position. The connection that existed between the lamplighters and the Corporation was explained; and it was contended by one of the speakers that the Directors of the Gas Company were the only aggressors in the dispute. Some of the gas workers seemed exasperated at this condemnation of their masters, with whom many of the men say they have no dispute, and are of opinion that it would be a very unjust proceeding to come out on strike against the Company, and inconvenience the public. The meeting had a noisy and abrupt termination. The feeling of the men appeared all in favour of remaining at work; but it was stated that a ballot would be taken.

WIMBORNE GAS COMPANY'S PROVISIONAL ORDER.

Board of Trade Inquiry—A Purchase Clause Desired by the District Council.

On behalf of the Board of Trade, Lieutenant Colonel YORKE has held an inquiry at Wimborne respecting the application of the Gas Company for statutory powers.

Mr. E. C. COOPER represented the applicants. Mr. H. W. DIBBEN appeared for the District Council; and Mr. M. LUFF, for other opposing Authorities.

Mr. COOPER, in stating the case for the Company, said it was formed in 1836; and from that date to 1854, its existence was a very chequered one. No dividend was paid until 1864, when one at the rate of 5 per cent. per annum was declared. From 1864 to 1874, inclusive, dividends ranging from *nil* to 10 per cent. were paid. For 43 years the Directors and Secretary worked entirely without fees. In 1875, a lease which the Company had granted for the then works expired; and soon after that, an opposition Company was formed in the town. The Directors then applied to the Board of Trade for statutory powers; but the application was withdrawn, and the works were removed to their present site—all the cost of removal being paid out of revenue. Throughout the whole of its existence, the Company appeared to have followed a progressive policy; reductions in the price of gas having been made from time to time. The price when the Company started was 14s. and it was now 3s. 9d. per 1000 cubic feet; the last reduction having been made as recently as July last. The total capital expended on the works had been £7000; but the whole capital of £10,000 had been raised—the balance of £3000 having been just called up. The Directors entered into a contract for some £1500 for additions to the works. Last year the Bournemouth Company promoted a Bill under which they sought to take part of the Wimborne area; but the Wimborne Company were successful in getting a clause inserted keeping the Bournemouth Company out of their district. It was worth noting in this connection that the District Council, who were opposing the present application, took no steps in reference to the threatened encroachments by the Bournemouth Company. Having thus been seriously threatened with invasion, and being desirous of raising more capital, the Company thought it conducive to their best interests to put the concern on a more secure footing. The Order they applied for was extremely simple. Under it they proposed to make up their capital to £25,000, and to put the dividends at 10 per cent. on the original capital of £10,000, and 7 per cent. on the additional capital. The quality of the gas was put at 15-candle power; and the standard price was to be 5s. per 1000 cubic feet, and subject to the sliding-scale. They also asked for an extension of limits so as to embrace Colehill and Pamphill. It was difficult to imagine how an Order of this simple nature could excite so much opposition. Meetings had taken place between the Directors and the objectors; and as a result liberal concessions were made by the former. The Local Authorities, however, seemed to think they had some right to demand that the undertaking should be transferred to them; and as the Directors could not consent to any such confiscation, they thought it best to have this inquiry, and take the decision of the Board of Trade. The concessions which the undertakers made at the conference between them and the objectors, they were still inclined to grant. They would reduce the capital to £20,000—that was, £10,000 original and £10,000 additional, with the usual borrowing powers.

Mr. LUFF here interposed with the remark that this was not the original concession, which was to reduce the capital to £15,000. Concessions were made at the conference which would have disarmed his opposition to the Bill; but the Directors had since withdrawn from the position which they then took up.

Mr. COOPER said they withdrew because the District Council insisted on a purchase clause. The Directors were still prepared to give up the power to trade in coal and fresh lime, reduce the standard price to 4s. 6d. on the sliding-scale, and fix the maximum price for public lighting at 4s. 9d. per lamp per month all the year round. The lamps were the property of the Company. They were also willing to submit to a clause compelling them to provide a testing-station in any part of the town, to be provided and maintained at the expense of the District Council.

Mr. *G. W. Graham* (the Chairman of the Company) was the first witness called; and he bore out the statement made by Mr. Cooper. The last reduction in price—from 3s. 11½d. to 3s. 9d.—was made in July last; but he now thought the concession was premature. The policy of the Company throughout had been to supply gas as cheaply as possible; and they had always had the most amicable relations with the local authorities and consumers generally.

Cross-examined: In the early stages of its career, the Company might have been mismanaged. Of late years the dividends had steadily improved; and as much as 10 per cent. and a bonus had been paid. Two bonuses had been paid within the past two years—one of 2s. 6d. per share and one of 5s. There had been no return made since the reduction to 3s. 9d.; so that he was unable to say whether the 10 per cent. dividend would be maintained with the reduction. Considerable sums had been spent out of revenue in improving the undertaking; and a reserve fund of £1000 had also been created. Under the present contract, the street-lamps in Wimborne were lighted at 4s. 5d. per lamp per month.

Mr. LUFF, at this point, agreed to a suggestion by Mr. Cooper that he should retire if the Directors adhered to the concessions made at the conference.

Mr. *H. E. Jones*, examined by Mr. Cooper, stated that he had examined the works, and found them well designed and compact. More facilities were needed for storing gas; and additions to the plant for the purposes of purification and other smaller things were wanted. The capital of the Company was exceedingly low considering its size; and it was evident that large sums had been spent from revenue, as there was more plant than the capital expenditure would procure. Further works were very much needed, and capital to the extent of £2000 or £2800 ought to be expended within the next eighteen months. He did not consider the capital excessive which the Company proposed to have under the Order; and he thought to fix the standard price at 4s. 6d. would be fair. He should advise the Directors to withdraw the Order if a purchase clause were inserted.

Cross-examined by Mr. DIBBEN, witness said statutory powers would increase the value of the Company; but he could not say to what extent. He thought an outlay of about £3000 was required at once in enlarging the works, exclusive of the extension of mains, &c., to Colehill.

Mr. DIBBEN argued that, the town being absolutely free from debt, was in a good position for purchasing the Company's undertaking. Although, the Directors had agreed to fix the amount of capital at £20,000, with a borrowing power of £5000, this was still excessive. It was inexpedient that a Company like this should have too large a capital, because it kept them out of Parliament for many years to come. The proposed dividends of 10 per cent. on original, 7 per cent. on additional, and 6 per cent. on preference shares, were also excessive. As to the standard price of 4s. 6d., he thought it was too high, as there was too great a margin between that and 3s. 9d.—the price at which the Company were now able profitably to produce gas. The charge of 4s. 9d. per lamp for public lighting was also too high, inasmuch as the present contract with the Council was only 4s. 5d. per lamp per month; and this was a charge upon which the Council thought some reduction could be made. An objection as to the breaking up of the roads had been met, inasmuch as the Directors had agreed to keep the roads in repair for twelve months after disturbance. In wishing to have a purchase clause inserted, the Council were actuated by the growing impression that gas and water-works should be in the hands of the local authorities, and the profits accruing therefrom go in the direction of relieving the rates. They had no complaint to make against the Company; but they thought a good profit could undoubtedly be made for the town if money were borrowed at 3½ per cent. and a dividend of 10 per cent. could be earned. The Council pressed for the insertion of the clause, because while they were prepared to give the fair present value for the business, they objected to having to pay for a spurious value which would accrue from the statutory powers asked for.

Mr. *Elcock*, examined by Mr. DIBBEN, said it was notorious that, during the early stages of its career, the Company was grossly mismanaged; but for the last twenty years, it had been well conducted and prosperous. He thought the capital proposed to be raised excessive, as Wimborne and Colehill were not likely to require the expenditure of anything like such a sum of money for a long period. The illuminating power of the gas now supplied by the Company was not very good; and he did not think the standard price should exceed 4s. 3d. As to the proposal to purchase the works, he thought the town should have the option for three years of buying them at their present value.

Mr. COOPER intimated that the Company were resolved not to take an Order with a purchase clause in it.

Other witnesses also considered that power should be reserved to the Council to purchase the works at their present value; and, after this evidence, the inquiry closed.

IMPROVEMENTS AT THE HERTFORD GAS-WORKS.

In the notice of the annual meeting of the Hertford Gas Company which will be found under the heading "Provincial Gas and Water Companies," reference is made to certain alterations which have been carried out at the works, in accordance with the plans of the Company's Manager and Secretary (Mr. R. Watson). The most important of them has been the erection of a new retort-house, with a retort-bench on the regenerative system of Messrs. Gibbons Bros., Limited, of Dudley, and a coal-store. Formerly there were two small retort-houses side by side, each containing four beds, or 46 retorts altogether. These, however, were of antiquated design and faulty construction, and were moreover insufficient, even when all were kept going, as remarked by the Chairman at the meeting above referred to, to produce the necessary quantity of gas. A new retort-house has been erected, and fitted with a bench of six beds, each containing seven retorts, making 42 in all. They are altogether larger than the old ones, so that 21 of the new will produce more gas than the 46 old, while there is sufficient additional accommodation to produce double the quantity of gas if it should be required. At the present time, four of these beds have been actually completed; and the remaining two are available for future requirements. The new plant has been in use for only a few weeks, but with a distinct advantage in the quality of the gas supplied to the consumers. The greatest make in a single day has hitherto been 131,000 cubic feet, but now from three beds of retorts 150,000 cubic feet can be turned out; and as already stated, with the six beds in operation, more than 300,000 feet can be made. Under the old system, each single retort used to yield about 3000

cubic feet of gas per diem; but, under the altered circumstances, 7000 cubic feet can be produced. Part of this increase is due to the enlarged size of the retorts; but the larger portion is owing to the greater heat obtained by the new system. Another improvement effected in the manufacturing plant is the addition of a washer-scrubber. The present storage capacity of the works is about 36 hours' consumption of gas.

THE HOME OFFICE AND CARBIDE OF CALCIUM.

In the "JOURNAL" last week (p. 459), we reproduced the notification issued by the Home Office in regard to the keeping of carbide of calcium, which has now, by an Order in Council, been brought under the provisions of the Petroleum Act, 1871. As from the 1st prox., it will be unlawful to keep carbide except under licence from a local authority; and with the view of assisting these bodies in dealing with applications for licences, the Home Office have issued a memorandum containing the following observations, drawn up by Colonel Sir V. D. Majendie, K.C.B., the Chief Inspector of Explosives, as to the character of the substance in question, and the prevention of the risks attaching to its keeping:—

1.—Carbide of calcium is a solid substance which, while not itself inflammable, evolves, when brought into contact with moisture, a gas (acetylene) which is of a highly inflammable character.

2.—This gas, when mixed with air, or when under even slight compression, becomes powerfully explosive.

3.—Carbide of calcium, unless carefully manufactured from suitable materials, is liable to contain impurities which, when the carbide is acted on by water, evolve phosphoretted or siliciuretted hydrogen—gases which, when evolved in appreciable quantities, would render the acetylene produced liable to spontaneous ignition.

4.—In addition to the risks indicated above, acetylene gas is capable of forming an explosive compound when brought into contact with copper.

5.—The character of the apparatus to be used in connection with the production of acetylene gas from carbide of calcium is intimately connected with the question of safety. For example, grave risk may arise from the heat developed by a too rapid conversion of the carbide into acetylene gas, or from the apparatus permitting escape or leakage of gas which is being formed, or not allowing a free passage of the gas from the generator into the holder, and so causing excess of pressure in the generator or other part of the apparatus.

6.—Risk might also arise if proper provision were not made for dealing with the residue of the carbide of calcium which has been used for making acetylene gas—viz., lime—as such residue might contain carbide of calcium which has escaped decomposition.

It will therefore be obvious that local authorities, in granting licences for carbide of calcium, should have regard to the foregoing risks, and with that view should make provision—

(*a*) For the exclusive use of hermetically closed packages for the keeping and conveying of carbide of calcium.*

(*b*) The adequate ventilation of the place where the carbide of calcium is present.

(*c*) The prohibition of any powerful compression of the gas produced in the apparatus or receptacles employed.

(*d*) The keeping and use of pure carbide of calcium only, and the establishment of efficient arrangements for the sampling and testing of the carbide.

(*e*) The exclusion of copper from all vessels or apparatus used with or for carbide of calcium and the gas produced therefrom.

(*f*) The use only of an apparatus which the local authority have satisfied themselves, under competent advice, is of a safe and suitable character, and the prohibition of the employment for the manipulation of such apparatus of any person other than a properly instructed and capable operator.

(*g*) The safe disposal of the residue, and the prohibition of its introduction into sewers, cesspools, &c., unless mixed with at least ten times its bulk of water.

It will, in all cases, be for the local authority very carefully to determine whether the premises proposed to be licensed are themselves suitable for the purpose; regard being had to the formidable consequences from fire or explosion which might result from the careless or imperfect observance of any of the imposed conditions, especially in dwellings or in places or premises where large numbers of persons are liable to assemble.

SALES OF STOCKS AND SHARES.

Mr. Alfred Richards conducted a successful sale of stocks and shares of various Gas and Water Companies at the Mart, Tokenhouse Yard, last Tuesday. He had received instructions from the Directors of the Lowestoft Water, Gas, and Market Company to sell £5000 of their 4 per cent. perpetual debenture stock; and this was the first stock offered. It was secured at prices ranging from £126 to £130 per cent.; the interest commencing on the 25th inst. Some "A" stock of the Barnet District Gas and Water Company, the last dividend on which was at the rate of 9 per cent., was next disposed of for £241 per £100, *cum div.* as from Jan. 1. A parcel of original £5 fully-paid shares in the West Ham Gas Company, the last dividend on which was at the rate of 9½ per cent. per annum, was knocked down at £11 10s. and £11 12s. 6d. each, with the dividend accruing from the beginning of the year. Some consolidated "B" stock of the Tottenham and Edmonton Gas Company, the last dividend on which was at the rate of 8½ per cent. per annum, but entitled to 9 per cent. if earned, was sold at £203 per cent., *cum div.* Fully-paid original ordinary £10 shares in the South-West Suburban Water Company, the last dividend on which was at the rate of 3½ per cent. per annum, found purchasers at £11 2s. 6d. each. The next parcel comprised fully-paid £5 "B" shares in the Ilford Gas Company. These were 7 per cent. shares, but the last dividend paid on them was at the rate of 8 per cent. per annum, and, at the present price of gas, they were entitled to 8½ per cent. if earned. The progress of this Company has been extraordinary; the number of consumers having increased from 175 in 1881 to 1220 now, and the sale of gas from 7 to 45½ millions—or by nearly 550 per cent. All the shares offered were purchased at £10 apiece; the buyers taking the dividend accruing from the beginning of the year. Some consolidated ordinary stock of the Tunbridge Wells Gas Company, the last dividend on which was at the rate of 11½ per cent. per annum, was knocked down at £290 per cent. *cum div.* A few £10 ordinary 10 per cent. shares in the Crays Gas Company fetched £26 each; and some new 7 per cent. shares, £17 2s. 6d. apiece—in both cases with the dividend accruing from the 1st of January. Some fully-paid original £10 shares in the West Kent Gas Company (last dividend 8 per cent.) were disposed of at £20 5s. each; and some new 7 per cent. shares, of like nominal value, on which £4 has been paid, were sold at £8 and £8 5s. each, *cum div.*

Among the recent sales by auction, we note the following: A parcel of original £25 shares in the Winchester Water and Gas Company was sold for £62 12s. 6d. At Bridlington Quay, £45 of local water-works stock secured a purchaser at £120. Last Wednesday, £3000 of ordinary stock of the Ilfracombe Gas Company was offered for sale. It is to rank for a maximum dividend of 5 per cent. The first six lots realized £12 10s. each, and all the stock was sold at an average of £11 12s. 6d. per £10. In Dundee, last Friday, 264 shares of £1 each, fully paid, in the Newport (Fife) Gas Company were sold at 19s. 6d. each.

ELECTRIC LIGHTING NOTES.

We have on previous occasions referred to the letters of "Citizen" to the "Yorkshire Herald" on the subject of electric and gas lighting. His latest effort in this direction is a refutation of the statement frequently made in public that electric light at 6d. per unit is as cheap as gas at 3s. per 1000 cubic feet. This comparison was brought forward by a member of the York City Council a short time ago; and "Citizen" very promptly condemned it as "absolutely and absurdly inaccurate." As the councillor made the statement on the alleged authority of Mr. Preece, "Citizen" gave him an opportunity of consulting that gentleman or Professor Kennedy, in order to put the matter to the test. This was done; and their replies were duly published. But, according to "Citizen," neither letter contained a scrap of evidence to justify the writer's general statements. He therefore repeated his criticism of the original comparison, and his challenge to the two eminent electricians to produce evidence to the contrary; and he then proceeded to refute it himself. This question of the comparative cost of gas and electric lighting comes before us so frequently in the form of inquiries from gas managers, that it may be of interest to reproduce this portion of "Citizen's" letter, as, though referring primarily to York, it furnishes data which may be useful elsewhere. He says: "When we speak of the illuminating power of gas as 16 candles, it means that when gas is consumed at the rate of 5 cubic feet per hour by the statutory burner (usually an argand) it will give a light equal to 16 sperm candles, each consuming at the rate of 120 grains of sperm per hour. Therefore, 1000 cubic feet of 16-candle gas will produce light equal to (say) 3200 hour-candles. The price of electric light is always stated in terms of the Board of Trade unit. Taking, then, the York Corporation Electric Lighting Committee's report (April, 1895), it is stated that a Board of Trade unit is 1000 watts, and will provide current for 33 8-candle power lamps, equal to 264 hour-candles, or for 16 16-candle power lamps, equal to 256 hour-candles. In ordinary electric light installations, and especially in private houses, there are probably more 8 than 16 candle power lamps used; therefore, in comparing the cost of gas and electric light, I will take the latter at its higher value—namely, 264 hour-candles per unit. The ordinary gas consumer in York now pays at the rate of 1s. 11d. per 1000 cubic feet, and thus gets, as per the statutory test (say), 3200 hour-candles of light for 23d., or 264 hour-candles, the equivalent of one unit of electric light, for 1·9d.—just under 2d.—while the largest consumers, who now pay 1s. 8d. per 1000 cubic feet for gas, get (say) 3200 hour-candles for 20d., or 264 hour-candles, the equivalent of one unit of electric light, for 1·65d., or just over 1¼d. But if, instead of buying their light in the shape of gas at the above rates, these consumers purchase its equivalent in the shape of electric light at 6d. per unit, they would be paying at the rate of 6s. 0¾d.—say, 6s.—per 1000 cubic feet for gas. To put it another way, the consumer who pays (say) £5 a year for gas at the rate of 1s. 11d. per 1000 cubic feet, would have to pay for its equivalent in electric light, at 6d. per unit, £15 15s. 9d.; and the large consumer who now pays £100 a year for gas at the rate of 1s. 8d. per 1000 cubic feet, would have to pay for its equivalent in electric light, at 6d. per unit, £363 12s. 8d. a year. The above comparison refers to gas consumed by the ordinary method, as prescribed by Acts of Parliament. But let us compare the cost of electric light with gas consumed by the Welsbach incandescent burner. Under favourable conditions, confirmed by high authorities, these burners will give a light equal to (say) 70 candles for every 5 cubic feet of gas consumed; and 1000 cubic feet will thus give 14,000 hour-candles of light. Therefore the gas consumer who pays 1s. 11d. per 1000 cubic feet will, by this method of burning, get the equivalent of one unit of electric light for (say) 0·433d., or less than ½d.; and the larger consumer, who pays 1s. 8d. per 1000 cubic feet, will get the equivalent of one unit of electric light for (say) 0·377d., or just over ⅜d. But, to extend the comparison, the smaller consumer who burns £5 worth of gas by the incandescent method in one year will have to pay for its equivalent in electric light at 6d. per unit no less than £69; and the large consumer who now pays £100 a year for gas will have to pay for its equivalent in electric light at 6d. per unit £1591." "Citizen" anticipates the objection that, in making his comparisons, he has taken gas at its best, and made no allowance for faulty burners and for the unfavourable conditions under which gas is very often consumed. His answer is that he has also taken electric lamps at their best.

The Local Government Board have given their sanction to the borrowing of £14,900 by the Colchester Town Council for purposes of electric lighting.

* The 9th section of the Petroleum Act specifies, among the conditions which may be included in a licence under that Act, the mode of carrying within the district of the licensing authority.

It will be remembered that the Walton (Surrey) District Council petitioned the Board of Trade not to grant the Walton Electric Lighting Provisional Order, and, in any case, to make the security of the promoters £1000, instead of £500, for the proper carrying out of the Order should it be granted. The Board of Trade have informed the Council that the Order will not be proceeded with.

The Battersea Vestry have fallen out with the Brush Electric Light Company, and have authorized the commencement of legal proceedings against them for an alleged contravention of their statutory powers by putting down a portion of their main on a part of Wandsworth Common which, it is contended, is in the parish of Battersea. The Vestry, who are about to deal in the electric light themselves, regard this as an act of hostile competition on the part of the Company; and they will not hear a word about a settlement without the removal of the main.

The St. Saviour's Board of Works have had the difference in the cost of electric and gas lighting laid before them in a way which appears to most effectually put to rout those members who had started an agitation in favour of the electric light. By the instructions of the Board, the Surveyor ascertained the terms upon which the City of London Electric Lighting Company and the London Electric Supply Corporation, both of whom have mains in the Borough, were willing to undertake the lighting of the five principal streets. The prices given by each Company made the annual cost of lighting the five streets upwards of £2000, which is more than is now paid for the lighting of the whole district by gas. On this basis, the cost of having the electric light in the entire area would be £11,000 per annum. The Board will not make any change in their present system.

A deputation from the Manchester Corporation, consisting of Aldermen Gibson and Higginbottom, Mr. W. H. Talbot (Town Clerk), and Mr. C. H. Wordingham (the City Electrical Engineer), have had an interview, in the presence of Sir Courtenay Boyle and other officials of the Board of Trade, with the representatives of the District Councils of Stretford and Withington respecting the applications of these Authorities for electric lighting powers. The result of the conference was that the Board of Trade decided to sanction the applications of Withington and Stretford to secure their own Provisional Orders for electric lighting purposes, leaving them to negotiate with Manchester at their discretion.

Last Thursday, a public meeting of owners and ratepayers of Manchester agreed to the inclusion in the Bill which the Corporation are promoting in Parliament of provisions to enable them to supply electricity beyond the limits of the city, by agreement with adjoining local authorities, and, further, to extend the powers of the Corporation in reference to the supply of electricity. Alderman Gibson stated that the proposal was purely permissive. All that was sought was power to enable electricity to be supplied at the request of the out-townships on the same principle as gas was.

The Northampton Electric Light and Power Company, Limited, are developing their business; but the profits at present are slender, and the capital is being piled up. The number of 8-candle power lamps in use has increased in the past four years from 4600 to 8014; and the last report shows that, whereas in 1891 there was a loss of £460, last year there was a profit of £1351. After setting aside £500 of this for depreciation, the balance was devoted to interest on debentures and temporary loans, and paying a dividend on the preference shares and 2 per cent. on the ordinary shares, after doing which £64 remained to be carried forward. Then we are told in the report that further 6 per cent. preference shares have been issued at a substantial premium, also additional debentures; and the original 5 per cent. debentures are being paid off or converted into new debentures bearing 4 per cent. interest. A "large amount" of new capital will also be required during the present year. With these enlargements of capital, it may safely be remarked that there will have to be a considerable increase in business during the current half year to maintain that 2 per cent.

Probably our readers may remember that some time ago a firm of enterprising electrical engineers succeeded in inducing a number of the shopkeepers in the Central Meat Market to take the electric light. The terms offered were certainly sufficiently reasonable to attract new customers—the supply being furnished at fixed annual charges, which it was arranged should compare favourably with the cost of gas. The system "caught on," and was apparently satisfactory. After a time, however, the suppliers began to find that the benefits were all on the side of the consumers; and so they had to introduce meters. This step was not altogether pleasing to the consumers, who, it seems, had the temerity to question the accuracy of these instruments, and even to doubt the economy of the electric light; and as another enterprising firm had been introducing their high-power regenerative gas-lamps with much success, the electric lighting firm bestirred themselves to prevent loss of business. They accordingly issued circulars dealing with these matters. Of course, they make out that nearly all the electricity meters in the Market are far more reliable, under the conditions of general use, than gas-meters; and they intimate that any customer can have his meter tested, and if it is found to be too fast they will pay the fee. They advocate the system of supply by meter as being the only one by which it is possible to give a uniform supply at the cheapest rate—any other necessarily favouring extravagant consumers at the expense of the more careful ones. This conclusion has no doubt been arrived at after experience of the working of the contract system. As a bid for custom, the firm in question offer to supply current at 3$\frac{3}{4}$d. per unit; this figure to include free installations, lamp renewals, cleaning, and maintenance. They go on to show how electricity compares with gas; and here, we think, their opponents will have the best of them. They acknowledge that London gas, when up to the standard, gives the light of 16 candles with a consumption of 5 cubic feet. So that 1000 cubic feet, costing 2s. 10d., will furnish the light of 3200 candles for one hour. It is asserted that to produce this amount of light electrically would require 9$\frac{1}{2}$ units, which at the price proposed to be charged would cost 2s. 11$\frac{1}{4}$d. This is, of course, very close, assuming their basis of 9$\frac{1}{2}$ units to be correct. The electrical engineer of an important town has given 10 units as the equivalent of 1000 cubic feet of 12-candle gas; and we venture to think that even the commonest gas-burner used in the Market would do better than this. But the electricians' competitors are suppliers of regenerative lamps; and to talk of 12-candle power when gas is burnt with such appliances as these is absurd. We should be more disposed to take 12 units as being necessary to produce the 3200-candle power; and this, at 3$\frac{3}{4}$d. per unit, would come to 3s. 9d., as compared with 2s. 10d. for gas consumed under only ordinary conditions. Of course, there are the cleaning and maintenance charges to be thrown into the scale in favour of electric lighting; but, on the other hand, there is the superior illumination obtainable by the use of high-power gas-lamps. The electricians claim that with their system 100-candle power only costs 1d. to 1$\frac{1}{2}$d. per hour; but taking the not unreasonable figure of 7 candles per cubic foot of gas burnt in a regenerative lamp, we should get twice the quantity of light for the same amount. It is true there is the initial outlay for the gas-lamp, presuming it is purchased outright; but we believe these lamps can now be acquired on the hire-purchase system.

A long report by the Electrical Engineer of Worcester (Mr. E. T. Ruthven-Murray), on the working of the electricity supply station during the past year, was presented at the last meeting of the City Council. There was a gross profit of £1602; but as £3218 had to be put aside for interest and sinking fund, there was a net deficiency of £1616. The number of lights had increased from 14,605 to 21,958; and the adoption of the Brighton system of charging for current was recommended. Mr. Ruthven-Murray states that the application of water power at the generating station had been justified during the past year, despite the dry season and the failure of the turbines to generate the power contracted for. The Engineer recommends the carrying out of various alterations; and as the whole of the lamps provided for have now been taken up in the city, he advises the extension of the plant at the generating station, at an additional cost of £8834. The report will be discussed at the meeting of the Council next month.

Harry White, a workman in the employ of the Hampstead Vestry, was last Saturday morning entering an electric transformer chamber in the roadway of Lyndhurst Gardens, in the discharge of his duty, when, through some cause yet to be explained, he was killed by the electric current passing through his body.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The proposed Stirling gas transfer has developed energy with amazing suddenness. It is apparent that, notwithstanding all that has happened in Stirling, the Police Commissioners are resolved to go on with the transfer. They have accordingly started the mutual reference which I mentioned recently, to Sheriff Lees. The proceedings commenced this morning in the Windsor Hotel, Edinburgh; and they are expected to occupy two more days. It will be remembered that, in terms of the report by Mr. James M'Gilchrist, the Corporation offered the Company £61,130 for their undertaking; and that the Company, on the recommendation of Mr. A. Gillespie, asked £68,320. The reference to Sheriff Lees is limited to fixing which of these amounts, or any sum between them, is to be the price of the undertaking. The agreement will then be embodied in the Bill the Corporation are promoting in Parliament; and it is almost a certainty that it will become law. The reference being a limited one, there is not the necessity for leading so much evidence as is usually done in arbitrations. As a matter of fact, it has been agreed that three witnesses only shall be examined on each side. There are for the Company: Mr. J. A. Robertson, C.A., of Edinburgh; Mr. Andrew Gillespie, Consulting Gas Engineer, of Glasgow; and Mr. J. Hepworth, of Edinburgh. For the Corporation: Mr. R. C. Millar, C.A., of Edinburgh; Mr. J. M'Gilchrist, of Dumbarton; and Mr. G. R. Hislop, of Paisley. The Company are represented by Mr. D. Chrystal, Solicitor, of Stirling; and the Corporation, by Mr. Clyde, Advocate. Mr. Robertson, Mr. Millar, and Mr. Clyde were all in the Dunfermline arbitration in October last, on the same sides as in this instance. The witnesses examined to-day were Mr. Robertson and Mr. Gillespie. Mr. Robertson had performed the necessary operation of reconstructing the accounts for the seven years from May 15, 1889, to May 15, 1896. The average annual profit during those years was £3209; but allowing 4$\frac{1}{2}$d. per 1000 cubic feet, and deducting this amount, he brought out a maintainable profit of £2864. In Falkirk, he said, where the annual make of gas is 62 millions, the price awarded was £77,050; and in Dunfermline, where the make of gas is 63 millions, the award was £91,900. The Stirling Gas Company, however, only asked £68,320. Mr. Robertson was pressed by Mr. Clyde to state the number of years' purchase he would recommend; but he declined, because that was a question for the Engineers. Mr. Gillespie said that 5d. per 1000 cubic feet was the usual allowance for repairs, maintenance, and renewals; but the services in Stirling being of lead, he reduced the figure to 4$\frac{3}{4}$d. He fixed the maintainable profit at £2854; and taking 26$\frac{3}{4}$ years as the period, he brought out a price of £76,132. He explained the alteration in his valuation from £68,320, to have been occasioned by Mr. Robertson's reconstruction of the accounts.

The very important action at the instance of Messrs. James M'Kelvie and Co., of Edinburgh, against the Arniston Coal Company, whose office is also in Edinburgh, but whose pits are at Gorebridge, was decided by Lord Low on Tuesday. It was at proof before his Lordship so far back as the beginning of November. Three full days were occupied in the hearing of evidence—Mr. James M'Kelvie being in the witness-box for more than a day; and the hearing of Counsel on the evidence was taken on other two days. His Lordship has had the case under his consideration for weeks. This prolonged deliberation over it shows the Judge's views regarding the magnitude of the issue he was trying; and indeed, to all who have knowledge of the coal market, his Lordship's taking time to thoroughly consider his judgment is fully endorsed. No case in recent years has created so much interest in circles which are concerned with the supply of coal to gas-works. I suppose this was in consequence of the line of defence—to the effect that the Messrs. M'Kelvie had not fulfilled their obligation towards the defenders, in the matter of supplying coal of the same class as Arniston to Bremen. As a matter of fact that defence has been entirely dissipated by Lord Low, whose decision rests upon an interpretation of the contract and the actions of the parties. But, apart from that, the leading position occupied by Messrs. M'Kelvie in the cannel trade of the world, and the fact that they felt it necessary to call in question the doings of one of the largest Scotch coal-producing Companies, was sufficient to make the case of more than ordinary interest. There was a further element in the case of a somewhat delicate nature, which

drew attention to it, in the fact that the pursuers were obliged to raise the question of the *bona fides* of third parties. It is always a difficult business to write of a lawsuit in which there are parties dragged in in the evidence who are not named as defenders. But in this instance Lord Low's remarks in court are open to consideration and construction. These remarks are given in another column of the "JOURNAL" to-day, and can be read and commented upon by all. According to Lord Low, the defenders had sufficient warning that their contract with the pursuers was being violated; and they did not take sufficient precautions to prevent the violation. It may be, and no doubt is, natural that a person who has a commodity to sell should be desirous not to curtail his opportunities for the disposal of it; and in that way he may not be so strict in his interpretation of binding clauses in a contract as a neutral person would be. But in this case the defenders bound themselves to give a monopoly in Bremen to the pursuers; and a bargain ought to be a bargain everywhere. Happily, in this country it is as yet not the rule—but very much the exception—that when an obligation is undertaken, an attempt is afterwards made to quibble out of it. That this was what was attempted here, Lord Low entertains no doubt. But there is this further to be taken note of, that the defenders' manager did not himself seek the opportunity of getting out of his obligation; it was rather introduced to him, and pressed upon him by the Glasgow merchants who, having purchased Arniston coal, seem to have shut their eyes to the fact that Bremen was barred to it, and either sent it there themselves or delivered it over to one who had no obligation in the matter, and who sent it thither direct. Lord Low's remarks on this subject are very severe; and when both sides of the question are looked at, it must be confessed that the firm in question deserve censure. Lord Low says that on Aug. 26—which was about two months before the despatch of the last two cargoes—the defenders' manager wrote a letter which showed that he was admittedly negotiating with Messrs. Stevenson in regard to coal which he believed was for Bremen. That is a pretty strong indictment of both the defenders and Messrs. Stevenson; and there it may well rest. But there are two points in the case which may be referred to. The oral evidence, and the correspondence which was produced in the case, cannot be published here, on account of considerations of space. But these brought out, in the first place, that Arniston No. 1 cannel is now realizing from 2s. 6d. to 3s. per ton less than Niddrie No. 1; and in the second place, that the coal which was supplied to Bremen turned out to be about 2s. per ton inferior to sample. Lord Low's opinion is a popular one. Messrs. M'Kelvie are being congratulated upon their having vindicated their position in reference to this contract; and I echo the sentiment, and express the hope that should any firm be placed in the same position, they may be able to establish their integrity as clearly as has been done in this case.

The action to which I referred on the 2nd ult., in which a widow sues the Glasgow and South-Western Railway Company and the Caledonian Railway Company for damages in respect of the death of her husband at the Dumfries Gas-Works, was to-day appealed to the House of Lords by the Caledonian Railway Company, who object to the decision of the Second Division of the Court of Session retaining them in the case.

The Gas Committee of the Hamilton Town Council, on Thursday, recommended that the Manager (Mr. W. Ewing) be paid an honorarium of £150. Regarding this, Bailie M'Hale, the Convener of the Committee, said the Committee had considered the question of an increase of salary for the Manager instead of an honorarium, for his services in connection with the extension of the works; and they had by a majority come to the conclusion that it would be better to grant an honorarium. The amount had been reduced to £150, not because the members of the Committee thought this was sufficient remuneration for the Manager's services, but as a concession to the opposition that was shown at the previous meeting. The Committee, with one exception, were still firmly convinced that an honorarium of £200 was not too much. With regard to the alternative of a substantial increase of salary, it was proposed that it should be dated from June, 1895, or 1896; but the majority thought it would be better to postpone any advance until the beneficial effects, or otherwise, of the extension were seen. There was considerable discussion upon the recommendation; but it was ultimately adopted by a large majority.

Mr. W. M'Crae, the Manager of the Dundee Gas-Works, reported to the Gas Committee of the Town Council on Tuesday, that during the winter he had received numerous complaints from residents in the west end of the city, and also in Invergowrie, regarding the want of gas at these places during the hours at which the business parts of the city were fully lighted. This complaint he had discovered to be well founded, especially so at Invergowrie, where up till between 10 and 11 o'clock at night the supply was very limited indeed. The deficiency, Mr. M'Crae explained, was accounted for by the extra supply of gas used in the large number of dwelling-houses which have in recent years been erected in Perth Road and in West Park Road; and in order to remedy the present state of matters, he suggested that the 8-inch main lying in Magdalen Yard Road, between Thomson Street and Windsor Street, be replaced by a 10-inch one. From the end of this extension, an 8-inch main would then be carried up Windsor Street and westwards along Perth Road to the west side of West Park Road; this replacing the 6-inch main at present in Perth Road. The cost of these improvements is estimated at £650. The Committee, after consideration, approved of Mr. M'Crae's report, and recommended in these terms to the Town Council.

A meeting of the Pitlochry Gas Company was held on Thursday, when it was unanimously resolved that the Company be dissolved, with a view to reconstruction. The new Company is to have a capital of £5000.

The Works Committee of the Edinburgh and District Water Trust have under consideration the subject of the new reservoir in the Talla valley, in connection with the augmentation to the water supply. It has been entrusted to a Sub-Committee to revise the schedules and specifications. The cost of the reservoir and connecting works is estimated at £150,000.

Saltash Water Supply.—The difficulty which was experienced in carrying water-mains across the River Tamar for the supply of Saltash appears now to have been overcome. On Wednesday last, the main was tested with apparently satisfactory results; and the water, which is derived from the Plymouth Corporation mains, was delivered at Longstone, the highest point in the borough of Saltash.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 524).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	24–26	..	4 0 9
100,000	10	,,	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	108–111	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	9½–10	–¼	5 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102–105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½–7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5–6	..	4 6 8
380,000	Stck.	26 Feb.	12	Brentford Consolidated	285–290*	..	4 2 9
240,000	,,	,,	9	Do. New	223–228*	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	138–143*	..	3 9 11
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	270–275	..	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	198–203	..	4 3 9
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	128–133*	..	3 15 2
420,000	20	15 Oct.	11½	British	57–58	+½	3 17 7
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23–25*	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20*	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	9½–10½	..	5 14 3
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101–103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	29–31*	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	15½–16½	..	3 12 9
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	338–343	..	3 18 8
165,000	,,	,,	10½	Do. New do.	255–260	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150–155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	260–265	..	4 18 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,620	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	315–320*	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250–255*	..	4 6 3
535,000	Stck.	26 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	138–143*	..	3 13 5
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143*	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	25–26	–½	4 4 7
354,960	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,896,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	312–317	–1	4 0 5
100,000	,,	,,	4	Do. B, 4 p. c. max.	108–113	..	3 10 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	307–312	..	3 4 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145–150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210–215	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	305–310	..	3 4 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	177–182	..	3 5 11
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	137–142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150–155	..	2 18 1
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12–13	..	4 12 4
3,800,000	Stck.	12 Nov.	12	Imperial Continental	210–215	+2	5 11 7
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	99–102	..	3 18 5
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk	104–107	..	3 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5¾–6½	..	4 16 2
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	111–115	..	4 6 11
250,000	100	,,	4½	Do. 4½ p. c. Debs.	109–111	..	4 1 1
541,920	20	12 Nov.	5	Monte Video, Limited	15½–16½	..	6 1 3
150,000	5	26 Nov.	8	Oriental, Limited	8½–9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7½–8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1½–2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas 1st Mtg. Bds.	100–105	..	5 14 3
500,000	100	1 Dec.	6	of Chicago 2nd Do.	100–105	..	5 14 3
250,000	10	30 Sept.	10	San Paulo, Limited	13–14	..	7 2 10
5,475,000	Stck.	26 F. b.	5½	South Metrop., 4 p.c. Ord.	145–148*	..	3 10 11
850,000	,,	14 Jan.	5	Do. 5 p. c. Deb. Stk.	169–172	..	2 18 2
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	280–290	..	3 19 4
60,000	,,	,,	8½	Do. B	190–200	..	4 5 0
182,380	10	30 Dec.	10	Tuscan, Limited	14–15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	333–338	..	3 2 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158–162	..	2 15 6
175,785	,,	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162–167	..	2 13 11
1,720,562	Stck.	15 Oct.	7	East London, Ordinary	225–230	..	3 0 10
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	162–167	..	2 13 11
225,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106–108	..	2 15 7
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	113–118	..	3 3 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
708,000	Stck.	12 Feb.	12	Kent	340–345	..	3 9 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	212–217	..	3 4 6
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	273–278	–2	3 8 4
406,200	100	,,	7½	Do. 7½ p. c. max.	222–227	..	3 6 1
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–153	..	2 12 3
500,000	100	12 Feb.	13	New River, New Shares	418–423	..	3 1 5
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152–155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	157–162	..	3 14 1
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150–155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 7
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	147–150	..	2 13 4
1,155,066	Stck.	11 Dec.	10	West Middlesex	310–315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7

*Ex div.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 6.

Sulphate of Ammonia.—Throughout the week, there has been good demand, resulting in a further advance; closing value being £8 2s. 6d. to £8 3s. 9d., delivered f.o.b. at the ports. Exports during February show a marked increase upon those in February last year; and there has been a satisfactory demand for home consumption. Current production has consequently, for the most part, been removed; and, stocks being more firmly held, available supplies have become less plentiful than was recently the case. Purchasing has been largely for "covering" speculative sales. But operators seem inclined to resist a further advance; and during the past few days, they have been rather hanging back. The hardening market has brought more inquiry from consumers; and a fair amount of direct business has been done. In the forward position, buyers do not show much interest. Leith is quoted £8 5s. per ton, ordinary terms, April-June delivery; but Beckton salts may be had at £7 12s. 6d. per ton, April-June, and at £7 13s. 9d. per ton, July-September delivery (Beckton terms).

Nitrate of Soda is quiet, but steady on spot at 8s. 1½d. per cwt. for good, and at 8s. 3d. per cwt. for fine, quality.

LONDON, March 6.

Tar Products.—The feeling with regard to tar products generally is a little more hopeful. Pitch is slightly firmer; and more inquiries come to hand for forward delivery. The deliveries against high price contracts are being taken fairly well; and the feeling is pretty strong that improved prices will be seen. Benzols keep steady at 3s. and 2s. 9d., having at present no apparent tendency either downwards or upwards. Carbolic acid has eased a little; and recent business is reported at 2s. 4d. for 60's. There is little doing in anthracene, which is quoted at about the same figures. Creosote is in good demand, and, with a falling off of production, is likely to see a higher figure. Creosote salts have dropped, as the demand seems to have slackened.

Values are as follows: Tar, 14s. 6d. to 21s. Pitch, 23s. Benzols, 90's, 3s.; 50's, 2s. 9d. Toluol, 2s. 3d. Solvent naphtha, 1s. 7½d. Crude, 30 per cent., naphtha, 1s. 1½d. Creosote, 1⅞d.; liquid, 1½d. Heavy oils, 45s. Carbolic acid, 2s. 4d. Napthalene, 60s.; drained salts, 30s. Anthracene, "A," 8½d.; "B," 7½d.

Sulphate of Ammonia has considerably improved during the week; and active business has been done at from £7 17s. 6d. to £8 5s., less 3½ per cent.

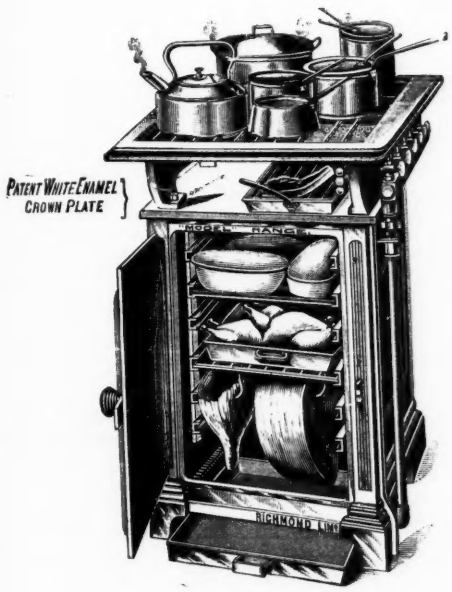
COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is a continued quieting down in the demand for round coals; and many of the collieries are going on to shorter time. Steam and forge coals met with fair inquiry; but supplies are in excess of requirements, and prices are consequently weak. At the pit mouth, best Wigan Arley is quoted at about 10s. to 10s. 6d. per ton—the lower figure representing more nearly the average actual selling price; seconds Arley and Pemberton four-feet range from 8s. to 8s. 6d.; common house-coal, from 6s. 6d. to 7s.; and steam and forge coal is about 6s. As regards engine fuel, supplies are still ample for requirements; but as there is a prospect of lessened output, owing to the decreasing demand upon round coals, the market has assumed a somewhat stronger tone, and prices are not being cut down quite so low as they have been of late. The resumption of operations at the chemical works, which are large consumers of slack, will also bring forward an increased demand; and on forward contracts collieries are in some cases again showing a tendency to harden in their prices. The average quotations, at the pit mouth, remain at about 3s. to 3s. 6d. per ton for common slack; 3s. 9d. to 4s. 3d. for medium sorts; and 4s. 6d. to 4s. 9d. for best qualities. The shipping trade has shown a slackening off; and with plentiful supplies offering, prices rule low—7s. 6d. to 7s. 9d. per ton, delivered at Garston Docks or the High Level, Liverpool, representing the average selling rates for ordinary descriptions of steam coal.

Northern Coal Trade.—With the full resumption of work by the railwaymen, there has been a very heavy production and shipment of coals; and considerable activity has been shown in meeting contracts. Best Northumbrian steam coals are quoted at 7s. 9d. to 8s. per ton f.o.b., for prompt delivery; second-class steam coals, at about 7s. 6d.; and steam smalls, at 3s. For delivery over the season, from 9d. to 1s. per ton above these prices is asked. In regard to gas coals, there is now a reduced demand; but it is still sufficient to give full employment to nearly all the best gas coal collieries. Prices of gas coal show little or no alteration, because most of the deliveries are now on long contracts; but for small quantities beyond these engagements, about 7s. to 7s. 3d. per ton f.o.b. is the general quotation. It is expected that the export of gas coals to the North will be commenced early this year, owing to the mildness of the season. Coke is very firm, with a large output and an increased export of good blast-furnace qualities. Gas coke is very abundant; the stocks at some of the inland works, such as Darlington, being extremely heavy, and the tendency being to reduce prices.

Scotch Coal Trade.—An active trade continues. The very stormy weather which has been experienced of late has interfered with shipping, and has given the appearance of a falling off in the demand which does not exist, except to the extent to which coal for gas-works is not now in such demand. Splint and main are, if anything, easier in price, though not quotably so. Contracts for next year are being looked into; inquiries being already on foot as to tenders. It is expected that there will be an advance in rates generally. The prices quoted are: Main, 6s. 9d. (easy) per ton f.o.b. Glasgow; ell, 7s.; and splint, 7s. 3d. The shipments for the week ending the 6th inst. amounted to 111,186 tons—a decrease of 17,818 tons on the preceding week, and of 7379 tons on the corresponding week of last year. For the year to date, the total shipments of coal have been 1,025,723 tons—being an increase over the same period of last year of 45,589 tons.



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Gas Cooking Range.

SPLENDID VALUE.

ALL BURNERS REMOVABLE.

WHITE ENAMELLED CROWN PLATE SUPPLIED FREE.

Prices, £3 7s. to £40.

A Free Trial of Public Lighting by the Incandescent Gas System at Wimbledon.—Some months ago, the Mitcham and Wimbledon Gas Company put up six lamps fitted with incandescent burners (one being a cluster lamp with three burners on the Broadway at Wimbledon) to show the District Council what the system was capable of doing. The Company undertook to supply the lamps, fittings, and gas for three months without charge; but already six months have elapsed, and no decision has been come to on the matter. They, however, have generously allowed the lamps to remain, much to the delight of the various bodies who select the Broadway for promulgating their views.

Water Gas at Birkenhead.—It was announced at the meeting of the Birkenhead Town Council last Wednesday that—in consideration of the large minority of the Council which expressed an opinion that further expert evidence should be given, and also that in conversation with gas consumers there was shown some (though quite unnecessary) alarm as to the effects likely to result from the supply of water gas in the borough—the Gas Committee had engaged Professor V. B. Lewes to make tests and report to them on the whole subject. One councillor suggested that Professor Lewes should also report whether the explosive power of water gas is equal to that of coal gas; and possibly this may be done.

The Gas Question at Arundel.—Major Mostyn, the Arbitrator between the Arundel Town Council and the Arundel Gas Company respecting the standard price of gas in connection with the Arundel Gas Bill, has made his award. Having fully considered the cases submitted to him, and taken expert evidence thereon, he has fixed the initial price at 4s. per 1000 cubic feet, with the condition that the Company are not to increase their dividend unless the figure falls below 3s. 9d. He considers it would be fair and equitable that the price charged for gas beyond one mile radius of the gas-works should be increased 3d. per 1000 cubic feet; but as this point was not in the reference, he does not make any award thereon. The Company and the Council have accepted the award as satisfactory; and consequently there will be no opposition to the Company's Bill.

Driffield Gas-Works Purchase.—On Monday last week, Colonel J. Ord Hasted attended at the Court House, Driffield, to inquire into an application by the District Council for leave to borrow the sum of £25,000 for the purchase of the Gas Company's works. Mr. Luke White (Chairman of the Gas Committee), in the absence of the Clerk, explained to the Inspector that the transfer of the undertaking had been sanctioned by the Local Government Board, and that the valuers had agreed upon £22,500 as the purchase-money. The Council asked for sanction to borrow the required money for a term of not less than 40 years. The sum of £25,000 was named in the application; but the amount now applied for was only £23,800, of which £22,500 was the purchase money, £909 included the costs and charges of obtaining the Provisional Order and expenses connected with the valuation, and £240 was added as the incidental cost of raising the money. The Inspector, after hearing the evidence, visited the works.

New Water Supply for Rhyl.—Yesterday week, an interesting ceremony took place at Glascoed (where the service-reservoirs supplying Rhyl and the district with water are situate) in connection with the completion of a new line of main pipes from the foot of Bodelwyddon Hill to Rhyl, at a cost of some £6000. In the absence through illness of Mr. Robert Jones, the Chairman of the Water Committee, the water was formally turned on through the new mains by Mr. Abel Jones (the Chairman of the Council), to whom, as representing the Chairman of the Water Committee, a silver goblet was handed, on behalf of the councillors, in honour of the event. Mr. Jones, in acknowledging the presentation, spoke of the energy and devotion with which Mr. Robert Jones had conducted the work of the Water Department. The cup was then filled with the newly-tapped water, and partaken of by those present. The laying and testing of the pipes was carried out by the Water Engineer of the Council, Mr. Leonard G. Hall, Assoc.M.Inst.C.E.

Gas-Works Questions at Coventry.—Once more the Coventry City Council have had a discussion on the question of constructing a railway siding for the gas-works. At last Tuesday's meeting, Mr. W. Johnson proposed that the Gas Committee be instructed to consider and report as to the desirability of providing a siding from the Nuneaton line of the L. & N.W. Railway to the works. He held that the present mode of carting coal to the works was a nuisance, and an absolute loss to the ratepayers of £2000 a year. Mr. Lee seconded the motion, remarking that it was important this matter should be settled, because in a report which the Council had in 1891, they were told that the siding would cost £12,000, and that they would save 14 per cent. per annum—£1680, besides all the inconvenience and dirt and nuisance arising from the constant stream of carts. If this amount could be saved then, how much more, he asked, could be saved now that the consumption of gas was so much greater? After considerable discussion, the proposition was adopted. In reply to an inquiry, Mr. Andrews informed the Council that the water-gas plant was now complete, and had then been working about a week. During the time it had been in full blast, the consumers had been supplied with a mixture of one-fourth water gas and three-fourths coal gas. The consumption of coal had greatly decreased. A month ago it was 250 tons a day; then it dropped to 190 tons; and, owing to the supply of water gas, there had been a further diminution of 60 tons, and consequently they had been able to discontinue carting coal during the night.

The Incandescent Gas Lighting Question at Deal.—For some time the Deal Town Council have had under consideration the question of adopting the incandescent gas system for lighting the public streets, but have been unable to agree with the Gas Company as to terms. Consequently, a Committee were appointed to find out what conditions prevail in other towns, and particularly seaside places like Deal. At a meeting last Tuesday, this Committee presented a report in which they called attention to the success of the system at Ramsgate, as detailed in a report by Mr. W. A. Valon, the Corporation Gas and Water Engineer, a *résumé* of which appeared in the "Journal" for Jan. 5. Mr. Bayly said that from this report they would see that the cost per lamp at Ramsgate, when using the incandescent light, was increased by 3s. 3d. This, however, would not be the case at Deal, owing to the difference in the price of gas; for while Ramsgate saved 3500 cubic feet of gas at 2s. 6d., Deal would save 3500 cubic feet at 3s. 10d. The Committee thought this definitely showed that if the Deal Gas Company supplied all the burners (and those of the best pattern), and still charged as at present £3 10s. 6d. per lamp, they would be in pocket over the transaction. Further, at Dover they had in use 800 incandescent gas-burners; and there it was found that the town received three times the illuminating power at about the same cost, while the Directors of the Gas Company stated that they had been enabled, out of the profits of the year, to discharge the entire cost of the application of incandescent burners to the public lamps. At Ipswich, too, the system was in use to the satisfaction of all concerned. As to the meter system, the Committee believed that, where it was properly and thoroughly worked, it was the fairest and most satisfactory way for the town to purchase its gas. The Committee thought it best to leave the Council the choice of four courses: First, to go on in their present unsatisfactory way, without any contract or agreement; secondly, to ask the Gas Company again, in the face of these facts, to give them incandescent lights; thirdly, to consider whether they should take over the lighting themselves, and pay for the gas by meter; and, fourthly, to determine whether, if they did this, they should themselves adopt the incandescent light. It was decided that the report should be forwarded to the Company.

An exhibition of the stoves manufactured by Messrs. John Wright and Co., of Birmingham and London, is being held at the Albert Hall, Commercial Road, Portsmouth; and Mrs. Charles Marshall is conducting in connection therewith a series of cookery demonstrations.

The cast-iron pipes for the improved water services for Ryhl, which, as mentioned elsewhere, was brought into use on the 1st inst., were supplied by the Staveley Coal and Iron Company, Limited; and the valves, air-valves, &c., by Messrs. J. Blakeborough and Sons, of Brighouse.

Messrs. Richmond and Co., Limited, of Warrington, Stratford, and London, held during the past month some very successful exhibitions in Balham and Battersea, under the auspices of the South Metropolitan Gas Company; cookery lectures being given with great success each day by Miss Clara Lennard, of Leicester.

During last week, two exhibitions of gas appliances were held at Southport—one in the Coronation Hall, Winter Gardens, by Messrs. John Wright and Co., and the other in the Temperance Institute conjointly by the Davis Gas-Stove Company and Messrs. Charles Wilson and Son. At the first, the cookery lectures were in the hands of Miss J. Baker; and at the second, Mrs. Springthorpe was the demonstrator.

The tenders for the issue of 2¾ per cent. debenture stock of the Chelsea Water Company, to realize £50,000, for which applications were invited in our advertisement columns a few weeks ago, were duly sent in by the 25th ult.—the day fixed. The amount applied for was £189,000; the prices offered ranging from £98 to £110. Tenders at £100 0s. 6d. will be allotted in part only, and those above this figure in full; the average price being £100 6s. 2d.

The attention of those of our readers who are desirous of securing stocks of gas and water companies may be directed to the announcements made elsewhere of approaching sales. Stocks of the Chester, Croydon, Ipswich, Lea Bridge, and Northfleet and Greenhithe Gas Companies, and of the Colne Valley and Fylde Water Companies, are coming upon the market; while at Mr. Alfred Richards's monthly sale on the 5th prox., a choice assortment of stocks and shares will be offered for public competition by order of executors and others.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see March 2, p. 498.]

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.

Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.

Information and Handbook on application.

70, CHANCERY LANE, LONDON, W.C.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

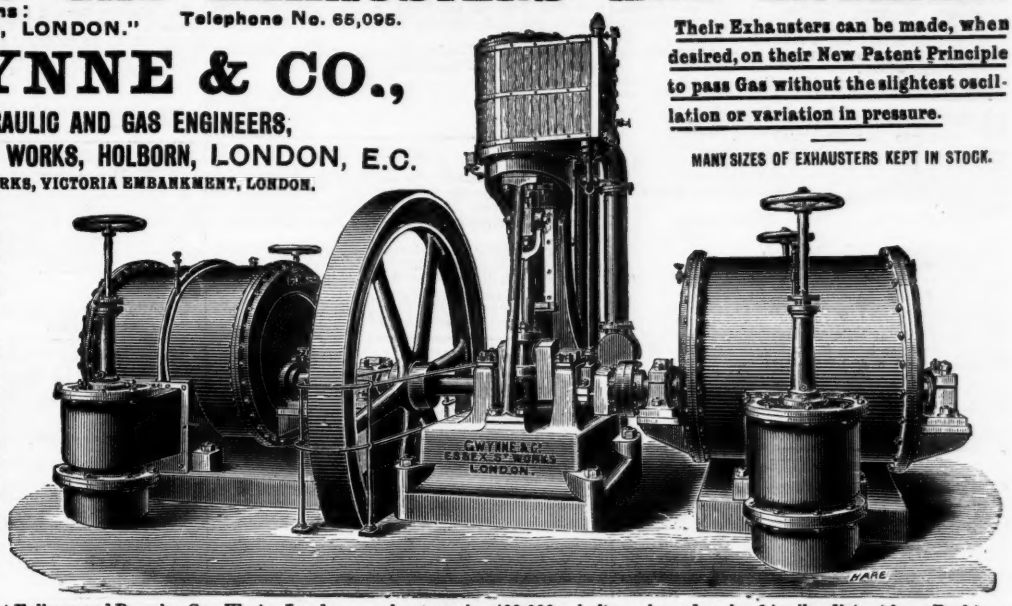
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TUBES for Gas, Steam, and Water (all Sizes), Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 498, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

RE-ENGAGEMENT wanted by WORKING MANAGER of Small Gas-Works. Used to Engine and Exhauster, accustomed to Main and Service laying, Meter fixing, and taking Indices. Ten Years' Experience. Good References. Abstainer. Married.
Address No. 2809, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks an appointment as ASSISTANT SECRETARY, or CHIEF CLERK, in Gas Company's Office. Thoroughly conversant with all duties appertaining to Secretarial work. Good Accountant. Excellent Character and References. Held present position in Secretary's Office for Ten Years and upwards. Salary required, £160 to commence.
Address No. 2811, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

WANTED, a Competent Gas-Fitter.
Apply, giving References, to P. G. WINSTANLEY, Gas-Works, NUNEATON.

WANTED, immediately, a Manager for a Carbonizing Works. Must have a thorough knowledge of all Departments.
Apply, by letter, stating full Particulars, Qualification, &c., to No. 2815, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Firm of Contracting Gas Engineers, a DRAUGHTSMAN well up in Designing and Detailing Gas Apparatus.
Apply, by letter, with References and stating Salary required, to No. 2812, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.

WANTED, for a Gas-Works near London, a First-class DRAUGHTSMAN, capable of preparing Plans of Buildings and Structural Ironwork, and the taking out of Surveys and Quantities.
Address, stating Age, Experience, and Salary required, No. 2813, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

In Paper Covers, Post Free 2s.

STEPHEN CARPENTER, late of the Bow Common Gas-Works, on the PURIFICATION OF COAL GAS BY LIME, &c., and the Method of Working Lime Purifiers so that the Lime may be used a second time, with a Description of a short Method of Working the Sulphur Test.
S. CARPENTER, "Ryde," Woodhouse Grove, East Ham, ESSEX; or of H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

TO GAS AND WATER OFFICIALS.

SPECIAL and favourable Terms for CYCLES are offered. The very best "up-to-date" Cycle at a reasonable cost. Splendid value for money. Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. FEATHERSTONE, 21, Old Queen Street, WESTMINSTER, S.W.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SKIPTON GAS COMPANY.

FOR SALE, Cheap—Six Wrought-Iron ANNULAR CONDENSERS, 20 feet high, 12-inch Connections, in good condition. Price £45.
J. HAIGH,
Secretary.

TO BE SOLD, cheap—39 Volumes of the "JOURNAL OF GAS LIGHTING," 1864 to 1888, bound in Cloth.
Apply, by letter, to No. 2814, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Four 8 feet square Purifiers, with 8-inch Connections and Centre-Valve, Lifting Gear, &c., complete. Also Four Sets of RETORT MOUNTINGS for 15-inch Round Retorts in Settings of Six; and Two 8-inch Four-Way Dry-faced BYE-PASS VALVES. No reasonable offer refused.
Apply to H. WIMHURST, Gas-Works, SLEAFORD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

ON SALE—Beam Pumping-Engine (owing to its replacement by a larger Engine), with all its Fittings, as it now stands at the Tower Works Pumping-Station, Chester Water-Works, where, on application to the undersigned, it may be seen at work, and from whom all further Particulars can be obtained.

EDWIN LLOYD,
Secretary.

Chester Water-Works Company,
15, Newgate Street, Chester.

STATION METER FOR SALE.

OFFERS are invited for a Round Station METER, of Milne's Manufacture, 15,000 cubic feet capacity per hour, in first-class order, including 10-inch Connectors and Valve Bye-Pass.

The Meter is presently in use, having to be replaced by a larger one, and can be seen by applying at the Hawick Gas-Works.

J. SMITH,
Engineer and Manager.

GAS-MAINS.

THE Aldershot Gas and Water Company desire OFFERS per ton, delivered at Aldershot or North Camp Stations S.W. or S.E. Railways, for about 3 Miles of 10-inch SPIGOT and SOCKET CAST-IRON PIPES. Usual Stock Weights and Sizes.

The Pipes must be sound, coated, or dipped with Dr. A. Smith's Solution, and tested before dipping, if required, in the presence of an Inspector, to a pressure of 100 lbs. to the square inch.

Address the SECRETARY, Aldershot Gas and Water Company, 103, Victoria Road, ALDERSHOT.

THE Middleton Corporation are prepared to receive TENDERS for the supply of the RETORTS required at their Gas-Works during the ensuing Twelve Months.

Further Particulars and Form of Tender may be obtained from Mr. T. Duxbury, Gas Manager.

The Corporation do not bind themselves to accept the lowest or any tender.

Tenders, endorsed "Retorts," and addressed to the Chairman of the Gas Committee, must be delivered at my Office, on or before Wednesday, the 17th of March, 1897.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
Feb. 26, 1897.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR, for One Year from Lady-day next.

Delivery on Company's Works filled into Purchaser's Tanks.

Sealed tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Monday, the 22nd day of March next; but the Directors do not bind themselves to accept the highest or any tender.

By order,
W. A. PADFIELD,
Engineer and Secretary.

Gas Offices: 248, High Street,
Exeter, Feb. 16, 1897.

CITY OF LEEDS.
(GAS DEPARTMENT.)

TENDERS FOR DRY GAS-METERS.

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the supply of DRY GAS-METERS, to be delivered at their Meter-Stores, during a period of Twelve Months from receipt of order.

Each party tendering is required to send on or before Monday, the 15th inst., two sample Three-Light Meters (one of which is to be open for examination), addressed to the Gas-Meter Works, Meadow Lane, Leeds.

Forms of Tender may be obtained on application to the undersigned at the Offices of the Gas Department, Municipal Buildings, Leeds.

Endorsed tenders, addressed to the Chairman of the Gas Committee at the latter address, will be received not later than Wednesday, the 17th inst.

The Committee do not bind themselves to accept the lowest or any tender.

R. H. TOWNSLEY,
General Superintendent.

CITY OF LEEDS.
(GAS DEPARTMENT.)

TENDERS FOR PURIFIER HOUSE AND PURIFIERS.

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the various works (Bricklayers and Ironfounders) required in the erection of PURIFIER-HOUSE and Eight PURIFIERS at the Meadow Lane Gas-Works.

Plans can be seen and Specification and Bills of Quantities obtained on application to the undersigned.

Tenders, suitably endorsed, and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Saturday, the 20th inst.

The Committee do not bind themselves to accept the lowest or any tender.

R. H. TOWNSLEY,
General Superintendent.

Municipal Offices, Leeds,
March 5, 1897.

THE Longford Gas Company, Limited (Ireland), invite TENDERS for the supply of Five CLAY RETORTS (Oval), 8 ft. 6 in. by 21 in. by 15 in., delivered free at Longford Railway Station. Also PRICE per 1000 for best FIRE-CLAY BRICKS, delivered free.

Parties sending Tenders are requested to state cost of building in the Five Retorts.

By order,
W. A. REID,
Secretary.

March 1, 1897.

TAR.

THE Direction of the Gas-Works at Rotterdam asks TENDERS for the purchase of the TAR produced during One Year, from the 1st of June next. Yearly production from about 80,000,000 Kg. of Coal.

Tenders, stating the Price per Hectolitre in Dutch money, and written in Dutch language on stamped paper, must be delivered at the Office of the Gas-Works not later than the 30th of March, 1897.

Specifications may be had on application to the MANAGER OF THE GAS-WORKS, ROTTERDAM.

BOROUGH OF CHORLEY.

TO RETORT MANUFACTURERS.

THE Chorley Corporation invite Tenders for the supply of 28 Ω-SHAPED GAS-RETORTS, 10 ft. long by 20 in. by 15 in.

Any further Information may be obtained from the Gas Manager.

Tenders, endorsed "Retorts," to be sent to me on or before Tuesday, the 16th of March, 1897.

By order,
JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
March 3, 1897.

WARRINGTON CORPORATION.
(GAS DEPARTMENT.)

TENDERS wanted for—

1. Wrought-Iron HYDRAULIC and FOUL MAINS.
2. ASCENSION and DIP PIPES.
3. SEAL-REGULATING VALVES.
4. CAST-IRON MAIN PIPES.
5. EXHAUSTERS.
6. TAR-EXTRACTOR.
7. SELF-SEALING MOUTHPIECES.

Apply for Particulars to Mr. W. S. Haddock, Engineer.

FREDK. TAYLOR,
Secretary.

Gas-Works, Warrington.

COUNTY BOROUGH OF BURY.

THE Gas Committee of the Corporation of Bury are open to receive TENDERS for the supply of 160 Tons of OXIDE OF IRON for Gas Purification, to be delivered free at the Gas Siding, Bury.

Full Particulars and Form of Tender may be had on application to Mr. W. H. S. Gendall, Engineer and Manager, Gas-Works, Bury.

Sealed Tenders, endorsed "Tender for Oxide of Iron," to be sent to me, the undersigned, on or before Saturday, the 20th of March, 1897.

Preference will be given to those persons or firms who pay to their workpeople the regular Standard Rate of Wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
March 5, 1897.

TENDERS are invited for Lighting the City of S. PAULO (BRAZIL) BY GAS, and must be sent under sealed covers, marked "Illuminaçao a Gaz da Cidade de S. Paulo," to the Secretaria da Agricultura, Commercio, e Obras Publicas (Department of Agriculture, Commerce, and Public Works), S. Paulo, Brazil, or to the Ministerio de Industria, Viaçao, e Obras Publicas (Ministry of Industry, Roads, and Public Works), Rio de Janeiro, in time to reach either of the said Departments not later than Three o'clock p.m., on the 30th of April, 1897.

Particulars may be had on application, by letter, to the Brazilian Legation, London; or to the Brazilian Consulates in London, Liverpool, or Glasgow, to the care of any one of which tenders may also be addressed, provided they are delivered soon enough to be forwarded for re-delivery to the said Departments by the date and hour above specified.

Plans of the City of S. Paulo may be inspected at the BRAZILIAN CONSULATE, 6, Great Winchester Street, LONDON, E.C.

SHEFFIELD UNITED GASLIGHT COMPANY.

ROOF OVER RETORT-HOUSE.

TO ROOF MANUFACTURERS & CONTRACTORS.

THE Directors of this Company invite TENDERS for the supply and erection of ROOF, PRINCIPALS, SLATE LATHS, and CAST-IRON GUTTERING for Retort-House at their Grimesthorpe Station.

The Roof is 350 feet long by 70 feet span.

Drawings may be seen, and Specification, with Bill of Quantities and Form of Tender, obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Roof," must be delivered by post to the undersigned, at the Company's Offices, not later than the first post on Saturday, the 3rd day of April.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
March 6, 1897.

URBAN DISTRICT COUNCIL OF PADIHAM.
(GAS DEPARTMENT.)

THE Gas Committee of the above Urban District Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR, to be produced at their Gas-Works for One Year commencing April 1, 1897.

For Particulars, apply to

J. R. SMITH,
Clerk to the Council.

District Council Office,
Padiham, Feb. 25, 1897.

TENDERS FOR PIPES.

THE Directors of the Tynemouth Gas Company are prepared to receive TENDERS for the supply of 3380 Yards of 24-inch CAST-IRON GAS-MAINS, and about 16½ Tons of SPECIALS.

Particulars may be obtained from the undersigned, to whom sealed tenders should be delivered on or before Wednesday, March 17.

W. HARDIE, jun.,
Engineer.

Gas-Works, North Shields,
March 6, 1897.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ASSEMBLY OF PROPRIETORS will be held at the Company's Offices, St. Helen's Place, Bishopsgate, E.C., on Thursday, the 1st of April, 1897, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED on the 18th of March, and reopened on the 8th of April, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, E.C.,
March 2, 1897.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Office on Wednesday, the 24th inst., at Half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 13th, and RE-OPENED on the 25th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 5, 1897.

COLNE VALLEY WATER COMPANY.

SALE BY TENDER OF TWELVE HUNDRED NEW ORDINARY SHARES OF £10 EACH.

MINIMUM PRICE, £14 PER SHARE.

NOTICE is Hereby Given, that it is the intention of the Directors of the above Company to SELL BY TENDER Twelve Hundred NEW ORDINARY SHARES of £10 each.

Particulars, with Forms of Tender, can be obtained on application at the Company's Office; and tenders must be sent in on or before the 20th of March, 1897.

By order,
WM. VERINI,
Secretary.

Office: Bushey, Watford,
March 2, 1897.

IPSWICH GASLIGHT COMPANY.

ISSUE OF £2500 NEW "C" STOCK,

In 250 Lots of £10 each. The Dividend upon this Stock for the past Three Half Years has been at the rate of 9 per cent. per annum, equal to 18s. per £10; and there is every prospect of it being maintained. The Dividend is paid half yearly (March 1 and Sept. 1), free of Income-Tax.

GARROD, TURNER, & SON will Sell BY AUCTION, at the Offices of the Company, Carr Street, Ipswich, on Tuesday, the 16th of March, 1897, at Seven o'clock in the Evening precisely, the above First-Class LOCAL STOCK.

Particulars may be had at the OFFICES of the COMPANY; of the Solicitors, Messrs. NOTCUTT AND SON, 9, Museum Street; and of the AUCTIONEERS, 1, Old Butter Market, IPSWICH.

By Order of the Directors of the
CROYDON COMMERCIAL GAS AND COKE COMPANY.

ISSUE OF £5000 NEW CONSOLIDATED "B" STOCK.

MESSRS. HOOKER AND WEBB have received instructions to SELL BY AUCTION, at the Offices of the Company, Katharine Street, Croydon, on Thursday, March 11, 1897, at Six o'clock precisely, in Seventy-Five Lots,

£5000 CONSOLIDATED "B" STOCK,

of the Croydon Commercial Gas and Coke Company.

The Dividend paid on the "B" Stock for some years has been at the rate of 11 per cent. per annum; and it is capable of further increase. The sale, therefore, offers an unusually good opportunity for safe Investment.

Particulars and Conditions of Sale can be obtained of Mr. W. J. RUSSELL, the Secretary, at the Offices of the Company, Katharine Street, CROYDON; Messrs. BLYTH, DUTTON, HARTLEY, AND BLYTH, Solicitors, 112, Gresham House, LONDON, E.C.; and of the AUCTIONEERS, 4, High Street, CROYDON.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
LEA BRIDGE DISTRICT GAS COMPANY.

£6250 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the above BY AUCTION at the Mart, London, E.C., on Monday, April 5, at Two o'clock precisely, in lots.

Particulars of the SECRETARY of the Company, 3, JEFFREY'S SQUARE, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
NORTHFLEET AND GREENHITHE GAS COMPANY, LTD.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, London, E.C., on Monday, April 5, at Two o'clock, in lots, 800 £5 fully-paid SHARES in the above Company, ranking for a standard Dividend of 7 per cent., subject to the Sliding-Scale; the last Dividend on similar Shares having been 8½ per cent.

Particulars of the SECRETARY, NORTHFLEET; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of Executors and others.
GAS AND WATER STOCKS AND SHARES
IN THE
Brentford Gas Company,
Hornsey Gas Company,
Imperial Continental Gas Association,
Peterborough Gas Company,
Isle of Thanet Gas Company,
Goring and Streatley Gas and Water Company,
Harrow and Stanmore Gas Company,
TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS at the Mart, London, E.C., on Monday, April 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CHESTER UNITED GAS COMPANY.

SALE OF £4000 ORDINARY "C" STOCK,
BEARING A MAXIMUM DIVIDEND OF 7 PER CENT., PURSUANT TO ACT OF PARLIAMENT, 43 AND 44 VIC., CAP. 9 (CHESTER GAS ACT, 1880).

THE Directors of the Chester United Gas Company GIVE NOTICE that £4000 ORDINARY "C" STOCK of and in the Chester United Gas Company, bearing a Maximum Dividend of 7 per cent., or so much of that amount as may be sufficient to realize the balance of £50,000 Additional Capital, authorized to be raised under the Powers of the Chester Gas Act 1880, will be offered for

SALE BY AUCTION
BY
MESSRS. BRANCH AND LEETE,

on Tuesday, the 23rd day of March, 1897, at One o'clock in the afternoon precisely, at the Law Association Rooms, Cook Street, in Liverpool, subject to the Conditions of Sale, which will be then produced.

The Stock will be offered in Lots of the nominal amount of £100 each, and will be issued to each purchaser as paid-up Stock after the full payment of the Purchase Money.

For further Particulars, apply to the undersigned, or to the Auctioneers, Messrs. Branch and Leete, Hanover Street, Liverpool.

By order
JAMES PYE,
Secretary.

Gas Offices, Cuppin Street,
Chester, Feb. 18, 1897.

FYLDE WATER-WORKS COMPANY.

TRUSTEE INVESTMENT STOCK.

TO be Sold by Auction, by Messrs. T. DEWHURST AND SON, at their Sale-Rooms, 122, Fishergate, Preston, at Three p.m. on Thursday, March 18, 1897,

£16,000
FOUR PER CENT. PREFERENCE STOCK

of and in the Fylde Water-Works Company, in pursuance and under the Provisions of the Fylde Water Act, 1891.

The Stock will be sold in lots of £100 each.

The Purchase is not confined to Stockholders in the Company.

£10 per cent. deposit on the nominal amount of the Stock purchased, together with the whole of the Premium, will be required to be paid at the time of sale; and the Balance of the Purchase Money will be payable on or before the 17th of April, 1897. The Stock will rank for Dividend from the date of payment of such Balance.

Under the Trust Investment Act, 1889, Trustees and others can invest in this Stock.

The Stock purchased will be issued free of all charge.

For further Particulars apply to William J. Dickson, Esq., Solicitor, Kirkham; or to
C. ARTHUR, Secretary.

Fylde Water-Works Office,
Cedar Street, Blackpool,
Feb. 10, 1897.

PUBLICATIONS
ISSUED BY
WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.

ALL PARCELS SENT CARRIAGE FREE.

THE
SIXTIETH ANNIVERSARY
OF THE
QUEEN'S REIGN.

Price (free by Post) 5s. 6d., Cloth,
EIGHTY-TWO DEVICES
FOR
GAS ILLUMINATIONS
With Instructions for Coloured Fires, &c.
By THOMAS NEWBIGGING, C.E.

This Collection of Devices was originally issued in connection with the Queen's Jubilee; but it will be found equally serviceable during the coming Celebration of the Sixtieth Anniversary.

TRANSACTIONS OF ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS OF THE UNITED KINGDOM FOR 1896.—Price, bound in cloth, 5/6. The Thirteen previous Volumes (1883-95) are still on sale, Price 3s. each.

NOTES ON THE LITHOLOGY OF GAS COALS, WITH LIST OF COMMERCIAL ANALYSES.—By JAMES PATERSON, C.E., F.G.S. Price 3/-.

ORDERS FOR OTHER TECHNICAL PUBLICATIONS WILL BE EXECUTED AT PUBLISHERS' PRICES.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

THE "COOMBE" DRAUGHT SCREEN
FOR INCANDESCENT BURNERS.
For Illustration and Statement of Advantages to be gained by its use, see "JOURNAL," March 2, p. 446.
ALFRED ARCULUS & CO., Glass Manufacturers,
BIRMINGHAM.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

TROTTER, HAINES, & CORBETT,

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FIRE-CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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EXTRACTION APPARATUS

SPECIALLY DESIGNED

TO EXTRACT THE SULPHUR FROM SPENT OXIDE.

BUILT BY

WEGELIN & HÜBNER, HALLE a/S.

ENGINEERS AND IRONFOUNDERS.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE STAFFORDSHIRE TUBE Co.

TELEGRAMS:

"EVESON, BIRMINGHAM."

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.

8 Lombard Street, NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON, FITTER.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

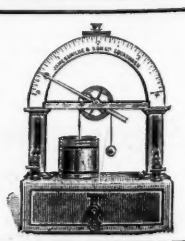
21, JOHN STREET, ADELPHI, LONDON, W.C.

JAMES MILNE & SON, LTD.,

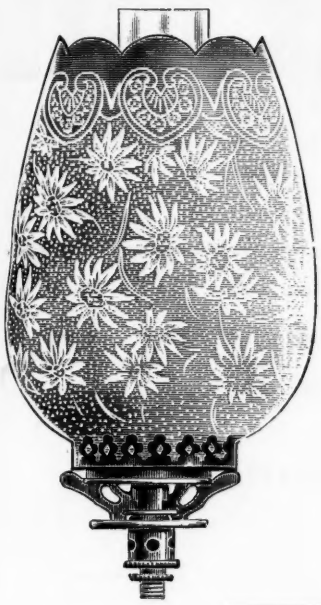
GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

LONDON. — GLASGOW. — LEEDS.



THE 'SUNLIGHT' INCANDESCENT GAS-BURNER.



COMBINES HIGH ILLUMINATING POWER AND GREAT ECONOMY OF GAS, WITH A SOFT PLEASANT LIGHT.

THE MANTLES ARE THE STRONGEST IN THE TRADE.

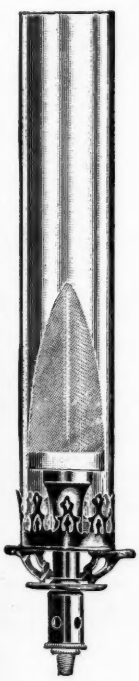
THE NEAREST APPROACH TO SUNLIGHT.

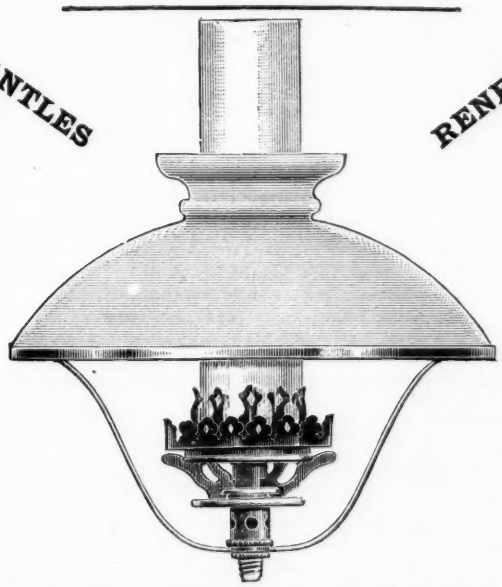
THE IDEAL LIGHT FOR DOMESTIC USE.

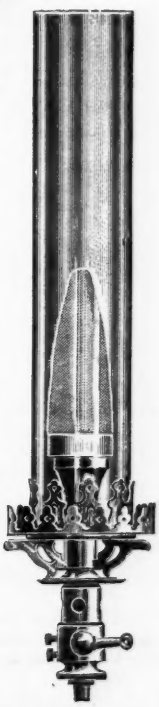
Price from 5/3 complete.

RENEWAL MANTLES 9d. EACH.

RENEWAL MANTLES 9d. EACH.







"COSMO" BURNER COMPLETE, as shown, 12-inch Shade, **7/9** each.

Price List and Terms on Application.

No. 5 Burner.

No. 3 Burner, with Bye-Pass.

THE NEW INCANDESCENT SUNLIGHT PATENT GAS LIGHTING COMPANY, LIMITED,

33 & 34, SHOE LANE, LONDON, E.C.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

SPECIAL TERMS OFFERED TO GAS AND WATER OFFICIALS.

"ROYAL EAGLE" CYCLES

(DUNLOP TYRES)

ARE

BUILT UNDER EXPERIENCED SUPERVISION.

RENOWNED FOR EXCELLENT DESIGN AND FINISH.

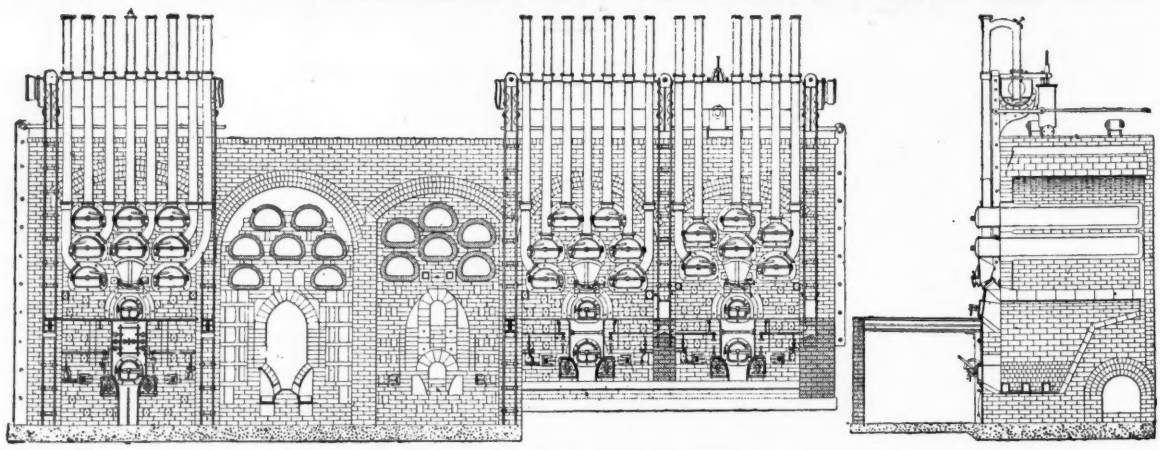
— PATRONIZED BY ROYALTY. —

Send at once for our Catalogue Album.

HOTCHKISS, MAYO, & MEEK, COVENTRY.

[Please mention "JOURNAL" when applying for Particulars.]

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, March 2, p. 496.]

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS, WOLVERHAMPTON." PLEASE APPLY FOR CATALOGUE No. 8. National Telephone No. 7039.

12,000 PUMPS IN STOCK AND PROGRESS.

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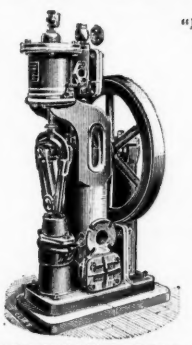

Fig. 705. "SINGLE RAM" STEAM-PUMP.

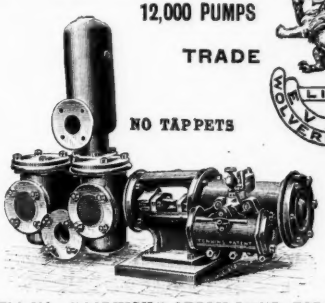

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

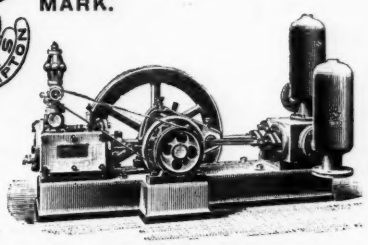

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

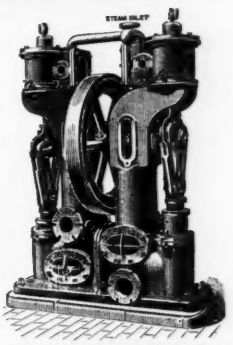

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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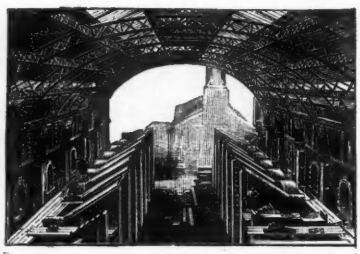

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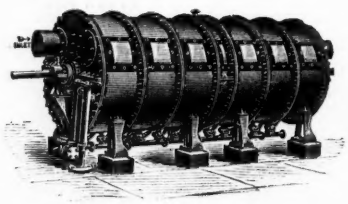

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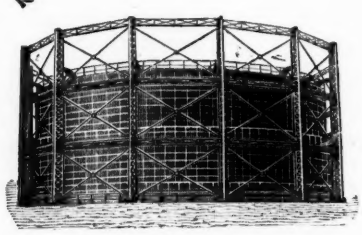

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Liverpool	3,500,000 ,,	Winchester	200,000 ,,
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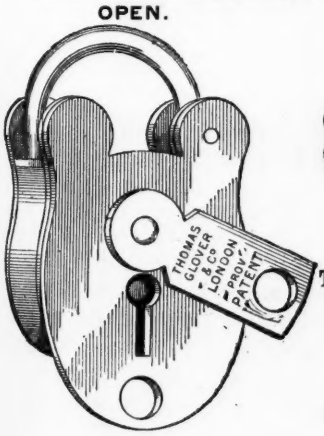

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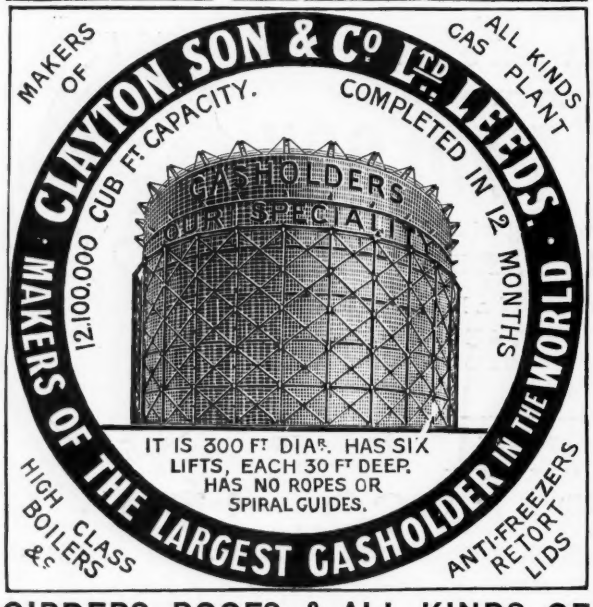
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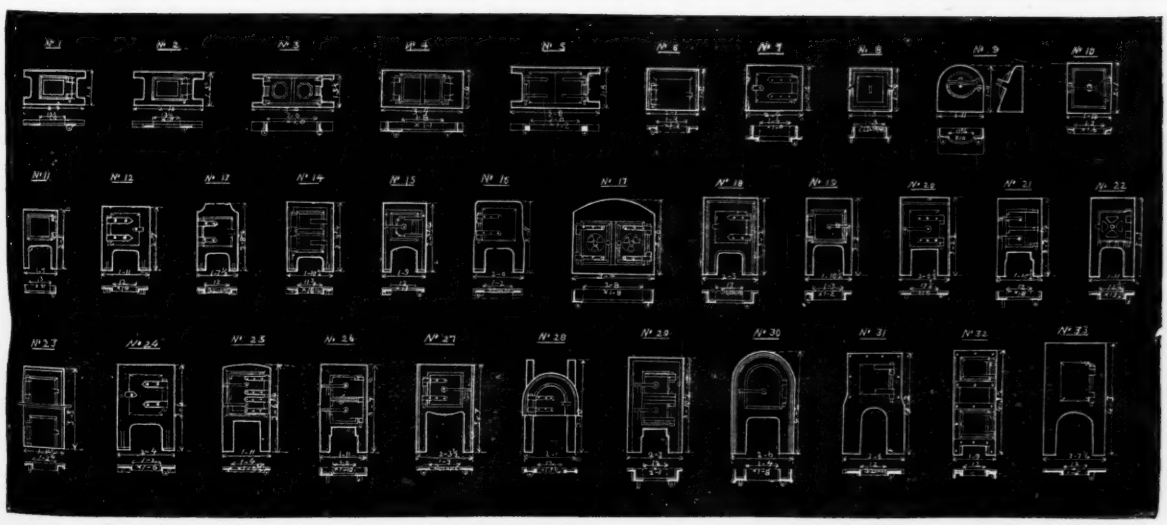

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[See also Advt. p. 520.

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